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ABSTRACT

This instructor's manual contains 21 lesson plans to teach advanced skills to cope with emergency outdoor living situations and emphasizes being prepared, rather than survival. Written for the classroom teacher, but adaptable for other youth groups, the module contains subject information, lesson plans with activities, student handouts, a written evaluation, and a glossary and bibliography. Each lesson plan includes a title, teaching method, suggested time, purpose, curricula, instructional aids, required facilities, and a detailed topic outline. Lesson plan topics include psychology of survival, examples of emergency situations, common fears and stresses, field first-aid/self-aid for bleeding, effects of cold and heat on the body, fire building, shelter building using poncho pup tent and A-frame; and water procurement using plastic bag still. Other lessons include food procurement (wild edibles, traps and snares); food preparation techniques (planking and mud baking fish); using a signal mirror; direction finding (primitive indicators and star movement); improvising clothing and equipment (rabbit hide mittens, poncho wash basin, poncho bathtub); natural environmental emergencies (cold, tornado, lightning); and emergency kits. Appendices provide an environmental emergency situation test, wind chill chart, items for automobile emergency kit, emergency kit sheet, suggested evaluation activities, and an instructor's key. (NEC)

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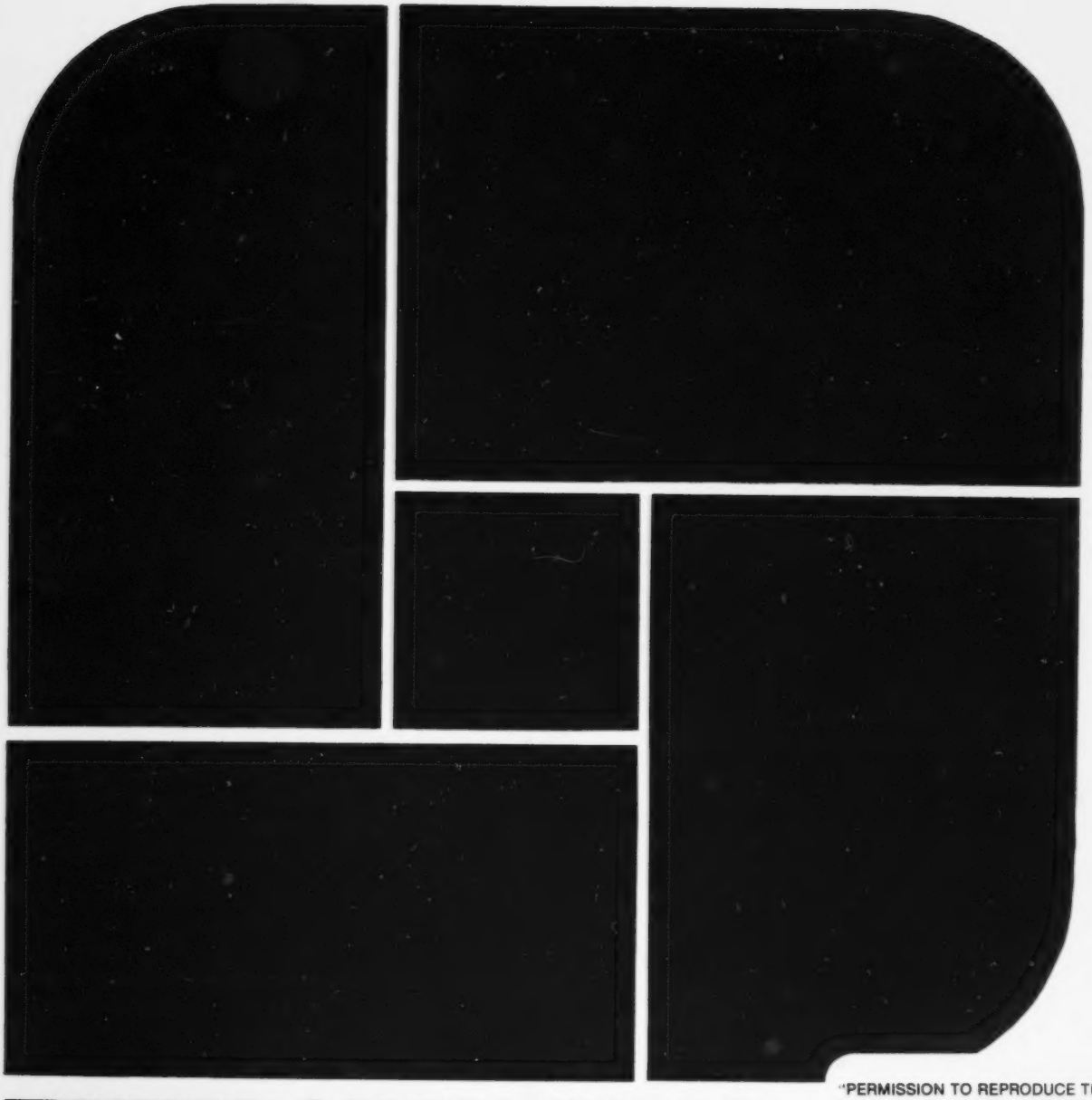

ENVIRONMENTAL EMERGENCY PREPAREDNESS

OUTDOOR LIVING SKILLS SERIES

A PROGRAM OF THE MISSOURI DEPARTMENT OF CONSERVATION

RC016055

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OUTDOOR SKILLS EDUCATION MODULES

Missouri's natural resources belong to all its citizens. More and more people are going outdoors to hunt, fish, boat, hike, camp, explore, and learn about nature. The skills they use in the outdoors can have a direct effect on resources. That's why it is important to educate youth and adults in how to use the outdoors wisely and responsibly through schools, community groups, and agencies.

The Outdoor Skills Education Unit of the Department of Conservation, in cooperation with the Department of Elementary and Secondary Education, is developing educational programs to teach Missourians how to use wisely and skillfully the state's many resources for outdoor recreation. The materials, presented as modules, can be used individually or combined in a series by schools, camps, clubs, scouting groups, and other youth or adult organizations. Topics include the shooting sports, casting and angling, trapping, archery, backpacking, camping, aquatics, map and compass, and other skill areas.

Each module is a self-contained unit that includes information on the subject, lesson plans, activities, class exercises, tests, suggested visual aids, and references. Experienced instructors who have taught the subjects and successfully used the activities have written the modules.

For additional information on conservation and outdoor education programs, write the Education Section, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102.

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INSTRUCTOR MANUAL

ENVIRONMENTAL EMERGENCY PREPAREDNESS

OUTDOOR LIVING SKILLS SERIES

MISSOURI DEPARTMENT OF CONSERVATION
EDUCATION SECTION

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Don Deaton was formerly on the faculty at Missouri Western State College in St. Joseph, and until June, 1984, was Coordinator of the Leisure Services undergraduate and graduate degree programs at the University of South Alabama in Mobile. Don is currently Vice-President of Research and Marketing for Hy-Stream Labs, Inc., Haskell, Oklahoma. He is also the Executive Director of Peak Adventure, Inc., a private organization founded to educate outdoor enthusiasts to safe, wise use of the natural environment and its inherent adventure opportunities.

Don wishes to acknowledge the work of Gene Fear and Tim Kneeland of Seattle, Washington; the Tacoma Mountain Rescue Unit of Tacoma, Washington; and the Council for Survival Education for their exemplary efforts in educating the public. Their assistance and knowledge is sincerely appreciated.

A native of California, Don holds a B.S. in Education from Northeastern Oklahoma State University, an M.S. in Health, Physical Education, and Recreation from Colorado State University; and a Ph.D. from the University of Utah. For several years Don has been training teachers and students how to safely enjoy the primitive outdoors. When time permits, he himself is off to a wilderness area to hike, fish, camp, and climb.

How to use this module

This module is designed to be used in conjunction with the *Basic Principles* module, which is an introductory unit. *Environmental Emergency Preparedness* teaches more advanced skills to cope with outdoor living situations. The emphasis is placed on being prepared, rather than survival.

The material has been written with the classroom teacher in mind, but can be adapted for camps, 4-H clubs, scouting organizations, and other youth groups. A variety of activities makes the module useful to many groups. Each module in the outdoor living skills series may be used individually or combined with other modules for a more extensive course.

The *Environmental Emergency Preparedness* module contains subject information, lesson plans with activities, student handouts, a written evaluation, and a glossary and bibliography.

Outdoor Skills Education Specialists are assigned to regions throughout the state. They will assist you in obtaining materials and scheduling equipment and films that are available from the Department of Conservation. Conservation Education Consultants also are assigned to regions and will discuss with you the Department's Conservation Education materials. Check the last page of this module for names, addresses, and regions.

Review committee

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Introduction

Goal of the module

To encourage individuals to be physically and mentally prepared for emergencies they might face in the environment.

Purpose

The purpose of this module is to make students aware of the potential hazards of the outdoors, to demonstrate ways they could prevent or overcome emergencies, and to encourage them to find solutions of their own.

Outdoor Missouri has many forms of recreation, from the cool pleasures of water sports to the adventures of camping, hiking, or hunting. Exploring the natural environment can be a lifelong source of enjoyment as long as travelers approach their outings with respect for the frailty of the human body and for the indifferent power of nature.

More and more citizens today, accustomed to the comfortable environments where they live and work, are unprepared for their outings—either in traveling from place to place or on a specific outdoor excursion. They forget that life-threatening situations can arise on any occasion. Each year deaths are reported that might never have occurred if the victims had been aware of the priorities for survival and had acquired the skills they need to face an emergency situation. That's why the emphasis in this module is on being *prepared* rather than having to *survive*.

Content

This module begins with a brief discussion of the priorities for life. It also describes how to cope mentally with an emergency, how to meet the needs of shelter, water, fire, signaling, and finding direction when usual conveniences are not at hand, and how to assemble an emergency kit.

The text is followed by lesson plans that include hands-on instruction for basic skills, such as building rough shelters, signaling for rescue, preparing food, and improvising clothing.

Objectives

Upon completion of this module, students should be able to do the following:

1. List the priorities for life in the order of their importance.
2. Discuss the importance of a "positive mental attitude" during an emergency situation.
3. Assemble a personal emergency kit.
4. Describe forms of shelter that can be constructed from natural materials in the snow and in the woods.
5. Build a fire using various techniques.
6. Create signals that would communicate with a ground search party or an aircraft.
7. Determine general direction by observing the sun, the stars, or other natural phenomena.
8. Recognize and treat chronic hypothermia and frostbite.

9. Recognize and treat the symptoms of heat cramps, heat exhaustion, and heatstroke.

10. List ways to prevent cases of hypothermia and hyperthermia.

Be Prepared

Expect the unexpected

Before you go:

Let someone know your travel plans.
WHO is going.
WHERE you are going.
WHAT you are doing.
WHEN you will leave and return.

The best way to be prepared is to expect the unexpected.

Editor's note: *The* Basic Principles *module is part of the Outdoor Living Skills series. To obtain a copy, contact your outdoor skills education specialist or write the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.*

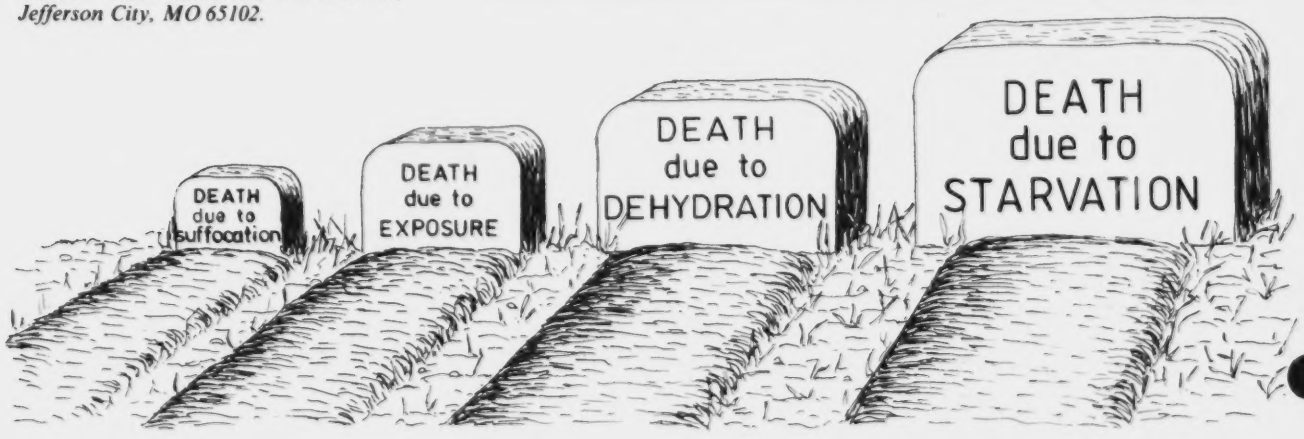
Travelers should learn to expect the unexpected. Weather can change drastically in a very short time. Any balmy spring morning in Missouri could end with a blizzard or flooding by dusk. The March 26 snowstorm that paralyzed parts of southern Missouri in 1978 is one example. A year earlier, 18 lives were lost during flash floods in Kansas City. In the spring of 1986, tornadoes destroyed large areas of southeast Missouri and left towns under water.

Humans have no control over such powerful forces of nature, but they can control their own reactions to emergencies—when they know what to do.

Faced with an automobile breakdown, a power failure, or a lost trail in the woods, the prepared person begins his wait until rescue by checking the availability of the priorities for life—air, shelter, water, and food.

As a review from the *Basic Principles* module, death may occur if the following essentials are denied for longer than the given times.

Air—3 minutes
Shelter—3 hours or less (in extreme conditions)
Water—3 days
Food—3 weeks



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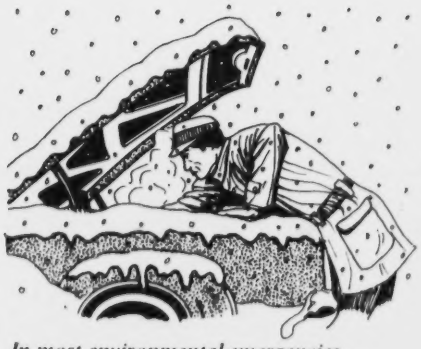
The truth about "survival"

The term "survival" is often misused. The word is dramatic, attracts attention, and may sound even glamorous to those who would like to test their wits and self-sufficiency in the wild. In a true emergency, survival means staying alive. In truth, however, most persons who find themselves in a survival situation are at least in part responsible for their predicament. Traveling remote roads with poorly maintained equipment, not letting people know where you are going and when you plan to return, and giving in to panic are shortcuts to danger. Unfortunately, there also are several misconceptions about survival.



In most environmental emergencies, survival is not a long-term affair.

MISCONCEPTION #1: Survival is a long-term affair.

In most cases, persons are rescued or out of danger within 72 hours. Adventures that last longer than three days might be better described as "primitive living." But one rarely hears about the short-term crises, especially if no lives are lost.

The long-term episodes of survival achieve more publicity, but often mistakes made by the victims contribute to the length of their dilemma. The book *Alive* by Piers Paul Reed is an excellent illustration of this. It describes a tragic plane crash in the Andes Mountains in 1972 and what the survivors did to stay alive until they were rescued.

MISCONCEPTION #2: You should seek food immediately in an environmental crisis.

Most victims are rescued long before finding food becomes a problem. Air, shelter, and water are higher priorities. You can live without food for three weeks or longer.

Those who seek food often harvest plants for nourishment. This action has two drawbacks. First, it may cost more energy (calories) to gather the plants than they offer. Second, there is the chance of eating toxic plants. Avoid plants you can't positively identify as edible. It is more important to conserve energy, so don't complicate the situation by consuming toxic plants.

We'll discuss other food-gathering techniques, such as trapping and setting snares or deadfalls, but these usually are not necesary unless the situation becomes long-term. (See module lesson plans for trapping information.)

The most important thing is to keep a positive mental attitude!

MISCONCEPTION #3: You must be confident of your abilities.

In an environmental emergency, it's more important to keep a positive mental attitude (PMA) than to depend on your confidence. If you lack confidence, small failures, such as the inability to start a fire, can be shattering and even lead to irrational behavior and tragic consequences. With too much confidence, you may overestimate your abilities, which also can be dangerous. A positive mental attitude will help you stay calm, make decisions, and clearly evaluate your situation.

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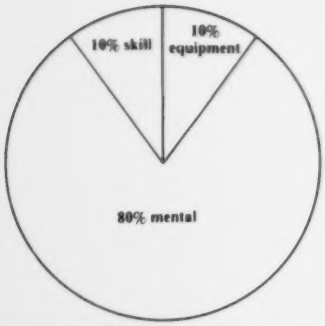


80% mental + 10 % skill + 10% equipment = 100% ALIVE!

MISCONCEPTION #4: You must be well equipped to survive an environmental emergency.

Don't put too much faith in equipment. The best of implements can fail when you need them the most, your survival kit may be at home, and the finest compass and map will be of no value unless you know how to use them. The only things you are guaranteed to have are your naked body—even clothes are a bonus—and your mind. But that's usually enough. Most survival and rescue experts agree that staying alive through a natural crisis is 80 percent mental, 10 percent skill, and 10 percent equipment.

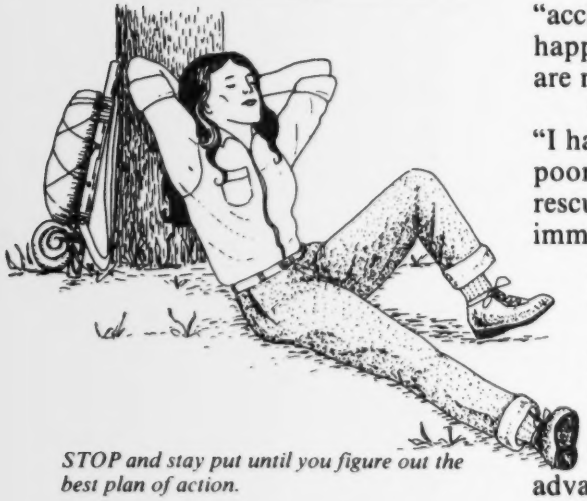
Your comfort zone

To deal with an environmental emergency, you must mentally adapt to a stressful situation and take charge. In other words, you must establish a "comfort zone."

Everyday examples of losing comfort zone may be an oncoming car in your lane, visiting a hospital, riding in a crowded elevator or in an elevator with a stranger, or being confronted by someone you don't like.

A noted social scientist Hans Selye theorizes that humans have three courses of action when confronted with stress: (1) adapt to the situation; (2) change the situation until you are comfortable; (3) remove yourself from the situation. Obviously an environmental emergency precludes the latter two choices. In a crisis, if you are going to adapt, you must control your mind!

Controlling the mind



STOP and stay put until you figure out the best plan of action.

How we think can be affected by attitudes such as "accidents always happen to someone else" or "nothing will happen to me." This couldn't be further from the truth. You are not always in direct control of any setting.

One of the worst traps you can fall prey to is a feeling of "I have to get home." Such an attitude can cause you to make poor decisions. The best thing is to STAY PUT and wait for rescue or an opportunity to travel safely. If panic seems imminent, follow the advice offered in the acronym **"STOP."**

S—Slow down. Sit down or grab an immovable object.
T—Think. Analyze the weather, terrain, available resources.
O—Observe. Look around. Catalog resources.
P—Plan. Conserve energy. Use resources at hand.
Now you are ready to take action!

One attitude or frame of mind that can be used to advantage is the will to live. Keep the positive thought that you *will* be rescued. Never give up hope. As intangible as it may seem, the will to live has kept people alive. Think positive!

Overcoming stress

Above all else during an environmental emergency, victims must quickly adapt to their situation and take charge. Yesterday's commitments and on-the-job pressures have no priority in this new setting. Victims who can accept these new stresses and avoid ill-considered decisions will be way ahead in the survival process.

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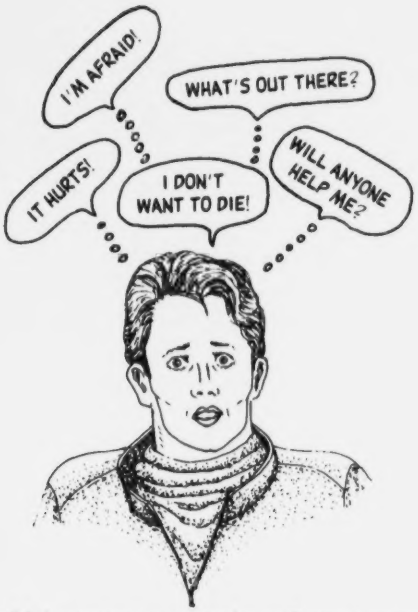
PSYCHOLOGICAL STRESSES

Fear and anxiety are two main stresses a victim must overcome in order to cope during any emergency. Anxiety is worry about what may happen. Fear may be defined as an anxiety caused by real or possible danger.

Some forms of this stress, as identified by psychologists, are as follows:

1. *Fear of being alone.* "No one can help me."
2. *Fear of darkness.* "What's out there?"
3. *Fear of strange environments.* "Never had to cope with this before.
4. *Fear of social ostracism.* "What will people think?"
5. *Fear of suffering.* "I can't stand the pain."
6. *Fear of death.* "I don't want to die out here."
7. *Fear of not being found.* "No one will look for me."
8. *Fear of animals.* "What if a pack of wolves comes?"
9. *Fear of personal weaknesses.* "I can't do that."
10. *Fear of heights* (acrophobia).
11. *Fear of enclosed places* (claustrophobia).

Fear can be an ally when controlled. It increases awareness and can be a source of unexpected energy in the form of adrenaline. Learning to recognize fear and to accept it is necessary before making a comfortable adjustment to the emergency.



It's important to recognize and accept your fear in order to make a comfortable adjustment to an emergency.

Symptoms of fear include rapid pulse, wet palms, dry mouth, trembling, nausea, irritability, and confusion. To combat fear, keep mentally and physically busy. Educate yourself by looking around and noting the resources at hand, and pray if it gives you comfort.

Also keep in mind that fear is contagious. A cool head can be invaluable in a group, where panic could cause disaster.

BODY STRESSES

Thirst, hunger, fatigue, heat, and cold are five physiological stresses that can be life-threatening during an environmental emergency. (The effects of heat and cold will be discussed later in this module.)

Thirst demands relatively quick attention. Humans can expect to live about three days without water, although this factor may vary according to environmental conditions.

Water is almost always available in any setting. When it is, drink to capacity. When it isn't, limit your physical activity so that your need for water will be less. (See *Basic Principles* module for a thorough discussion of water as a priority for life.)

If water is available, drink to capacity. If it isn't, limit your physical activity.

Whenever a water shortage exists, some recommend the construction of a solar still, a device that will collect about one quart of water per day under good conditions.

But even when you have the means to build a still, don't forget to ask the question, "Is the amount of water to be gained worth the energy and liquid expenditure required to build the still?" In cases of extreme heat stress, the amount produced will not approach the amount required for keeping the body alive.

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There are other means for gathering, conserving, and trapping water that should prove more productive. By improvising, you can usually find containers suitable for catching and storing water. Fabric can soak up the dew. Cans, buckets, bottles, and hats can be used to catch rainwater or runoff—all with minimal effort.

Water quality is also a concern. If no method of purification is available, then you must determine the degree of risk, weighing the chance of illness with the likelihood of death if no water is consumed.

Turbid or scummy water may look dangerous, but if life forms can be observed in the water, you should take the chance. If no sign of life exists, the water is likely to be hazardous.

Do not drink saltwater under any circumstances.

Hunger is a stress factor that can become more of a psychological problem than a physical one. Finding food should be a concern only after all other problems are solved. During any emergency, make up your mind that hunger is a low priority; conserving energy is the key.

Handling fatigue is a difficulty in most survival situations. When victims are unable to sleep, they leave their bodies in a weakened and vulnerable state. Rest often, and try to relax to the point of sleeping.

Conserving energy is the key!

Improvising

Improvising is attempting to make do with what is conveniently at hand. It can be an exercise in creative thinking.

The first step in improvising is to analyze the situation at hand and to anticipate your needs.

What do you need to get by?

(Shelter? A fire? Something to keep your head and hands warm? A utensil for drinking?)

What is it normally made of? Could it be made from different materials?

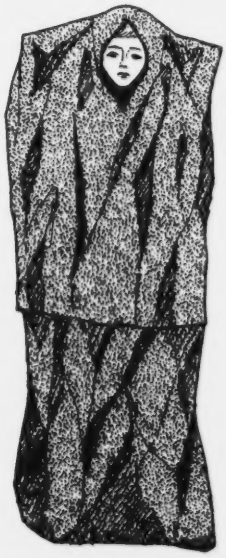
Can you build or make it from resources at hand?

Look around at the items in the area—both natural and man-made. (Car, boat, or plane? Cans? Logs? Pack equipment? Water?)

Check your pockets and clothing for other materials. Chances are you will discover more than you expected—keys, coins, paper, belt buckle, shoelaces, watch, string, knife. Don't overlook anything because you think it isn't useful.

After searching the area, adapt what you have to your needs. Experiment. Use your imagination. Keep thinking until you come up with a solution: You can make a windbreak or lean-to with logs and sticks. A cigarette lighter will help start a fire. An extra pair of socks will serve as mittens. An empty can is a good drinking cup.

Above all, don't give in to frustration. Expect some false starts, but keep practicing your positive mental attitude.



Garbage bags will keep you warm and dry.

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Shelters

Second priority for life

Shelter—anything used to protect the body against the elements—is the second priority for life. Most of us today are used to homes and vehicles that are heated and air-conditioned. Comfort is as simple as adjusting a thermostat. But when our protections are removed, the extremes of cold, heat, wind, or rain can be life-threatening. In extreme exposure, death can occur in as few as three hours.

Clothing is the most basic form of shelter. Anyone venturing outdoors should wear or have clothing available to accommodate weather changes. (See the *Basic Principles* module for a discussion of the forms of heat loss and for suggested seasonal clothing lists.)

Shelters provide a second layer of insulation from the elements. Before constructing an emergency shelter, victims should stop, think, observe, and plan how they can best protect themselves. What is available for building the shelter? What is the best location for the shelter?

Select a shelter site away from avalanche areas, dead trees or snags, drainage pathways, ridges, insects, and swamps. Find a site that is near water, firewood, natural windbreaks, a signaling area, and the stalled transportation or wreckage if there is one.

Always consider whether the amount of energy you will save by being protected from the elements will be greater than the amount of energy you will need to build the shelter.

Many life-saving shelters can be carried with you. Sheets of plastic, large plastic bags, tarpaulins, or tents should be considered for inclusion in any baggage. (See "Tarp Tricks" in *Historic Crafts and Skills* module for more ideas.) But if you find yourself stranded with no supplies, let nature provide them for you.

Editor's note: *The* Historic Crafts and Skills *module is in the Historic Skills series. To obtain a copy, contact your outdoor skills education specialist or write the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.*

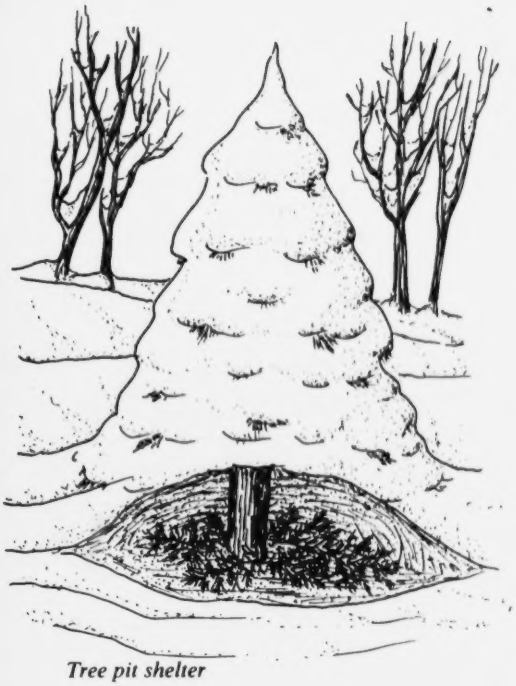
Improvising a shelter

The purpose of the shelter should always determine its design. Do you want to be protected from freezing temperatures? Insects? The sun?

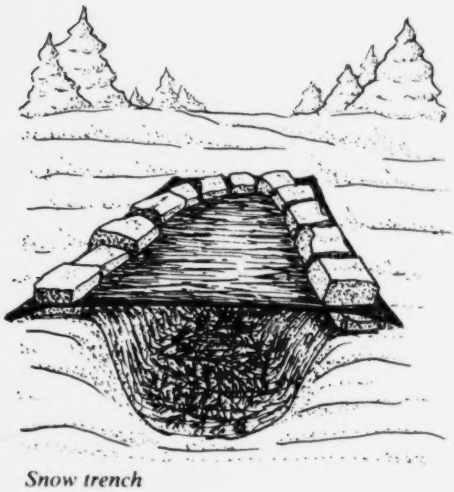
Then look around for a natural framework. In wooded areas, you might use a blowdown, hollow logs, limbs, caves, leaves, or rock outcroppings. Most woods will offer plenty of opportunities. In cold situations, keep the shelter as small and cozy as possible.

Snow can be both enemy and friend to emergency victims. Snowstorms may break power lines or halt travel, but the same snow, formed into a shelter, can also keep stalled travelers from freezing to death.

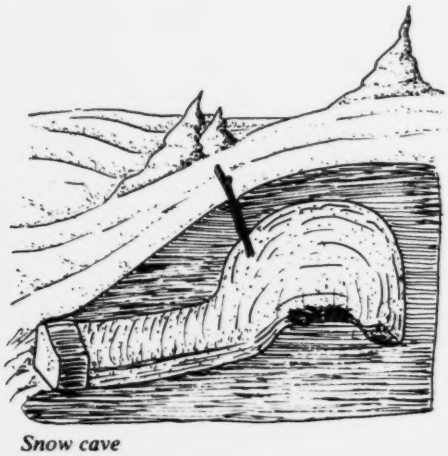
By insulating their occupants from colder, outside air, tree pit shelters, snow trenches, snow caves, and powder huts make efficient outdoor shelters. And they're easy to make. Igloos, the dome-shaped Eskimo dwellings made out of snow blocks, provide great protection, but require too much energy and specific skills to build.



Tree pit shelter



Snow trench



Snow cave

TREE PIT SHELTER

A tree pit shelter can be constructed with little energy if the proper elements are present. Enlarge the natural pit of snow from around a tree trunk. Roof the pit with any available materials, such as limbs, cloth, or plastic. Insulate yourself from the cold ground by using boughs, bark or other relatively non-absorbant material. The completed pit should be deep enough to sit in.

SNOW TRENCHES

Individual snow trenches are also efficient. Simply dig a trench in the snow about 2 feet deep and just wide enough for comfort. Place insulating material, such as soil, boughs, or leaves on the bottom. Fashion a roof, and the shelter is complete.

SNOW CAVES

A snow cave is carved from a deep snowdrift and takes two or three hours to complete. Any kind of shovel is helpful, or you may need to improvise a digging tool.

Hollow out a domelike room inside the drift with an entry tunnel sloping downward toward the exit to counter the flow of cooler air. Insulated platforms for sleeping or sitting can be formed inside, at least one foot above the entrance. A vent hole should be punched through the roof and kept open by ramming a stick through it occasionally.

The dome construction gives the shelter strength, and the arched, inner roof keeps melting snow running down the sides of the cave so it doesn't drip on the occupants. The snow cave should be shallow enough and the roof thin enough that the occupants can stand up and break through in case of a cave-in.

POWDER HUTS

When a snowdrift is not available, which is almost always the case in Missouri, you can create a drift from the existing snow cover and carve out a powder hut instead. At minimum, a mound of snow that is 6 feet deep and 12 feet in diameter must be accumulated.

To measure your mass of snow, find two sticks about 6 feet long. Set one vertically in the snow. Place the other stick on the ground, touching the vertical stick, and scribe a 12-foot circle into the snow.

After accumulating this pile, wait until the snow settles. An audible "thump" will be the signal, usually after an hour. Begin hollowing out a living space by digging a tunnel into the center, enlarging the cavity and pushing the excess snow to the outside. Finish the inside just as you would a snow cave, again with the entrance at least one foot below the living quarters. Force a vent hole through the roof. The walls should be left 1 or 2 feet in thickness.

The snow cave and powder hut make good shelters because the interior temperature will remain at 32° F (0° C) or

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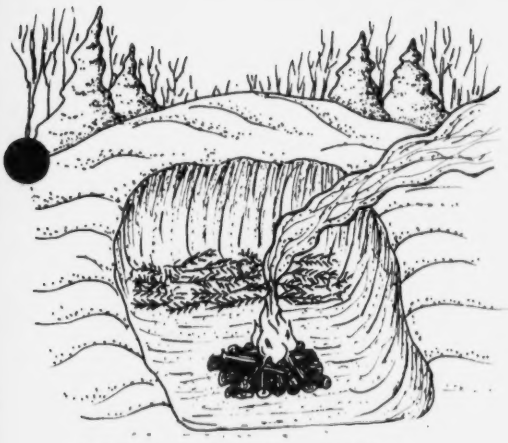


Taking advantage of a snowdrift

above, regardless of how cold it gets outside. While building the snow shelter, take care to remain as dry as possible. If no extra clothing is at hand, rearrange your attire so that any wet garments form your outer layer of clothing once construction is completed. Work slowly and avoid perspiring during construction.

As a final warning, if your stay in the cave or hut lasts two or more days, moisture from your own body and respiration may accumulate on the walls of the cave and form an interior glaze of ice. This could cause an oxygen shortage. Inside, frequently check for ice and scrape the glaze away so that the porous snow can allow air inside.

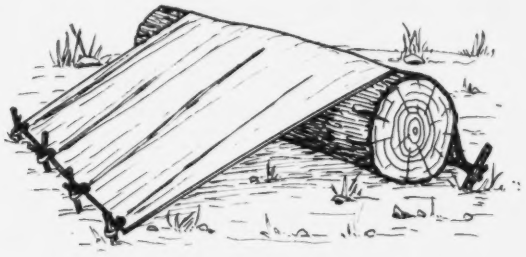
Also, if stoves, candles, or fires are used inside the shelter, carbon monoxide poisoning becomes a danger. The flames themselves can indicate the prevalence of oxygen. A blue flame shows a safe level. Lots of yellow showing in a flame indicates a low oxygen supply.

Editor's note: *The* Backpacking *module is part of the Outdoor Living Skills series. To obtain a copy, contact your outdoor skills education specialist or write the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.*

OTHER SHELTERS

For those who wisely are prepared for the worst when they travel, manufactured shelters, such as tents, sleeping bags, or tarps, are widely available and are always a good idea. (Refer to the *Backpacking* module for a description of tents and sleeping bags.)

Shelter using a canoe and a tarp



Shelter using a log and a tarp

The effect of cold on the body

HYPOTHERMIA

If you don't take care of the second priority for life, the results can be dangerous, especially in cold weather.

The leading cause of outdoor-related deaths is hypothermia, also known as exposure sickness. Hypothermia is a lowering of the core body temperature. It is a serious threat to anyone unprepared for cold weather, and especially to older persons, who are more susceptible to cold.

Hypothermia may be separated into two broad categories—*chronic,* or long onset, hypothermia, and *acute*, or rapid onset, hypothermia. Chronic hypothermia is generally associated with being exposed to cold weather for a time, that may range from a few hours to several days. It is generally caused by inadequate preparation and the victim's overestimation of his ability to withstand cold. Acute hypothermia is generally associated with immersion in cold

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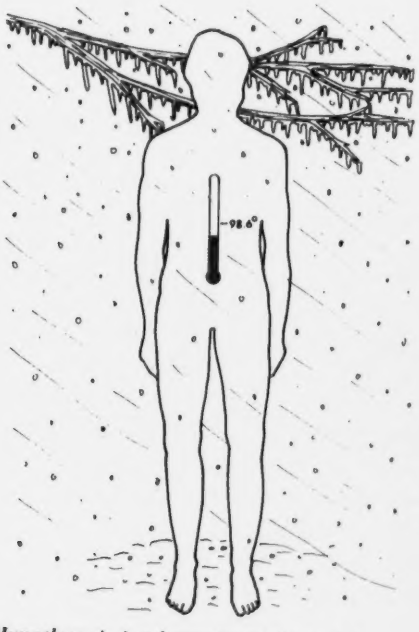

Hypothermia is a lowering of the body's core temperature.

Editor's note: *Information on Signs and Symptoms of Hypothermia was taken from* HYPOTHERMIA: Death By Exposure *by William W. Forgey, M.D.*

water. Since water can conduct heat 25 or more times faster than air, acute hypothermia may begin to develop in as little as 10 to 15 minutes or take several hours. Treatment is different for the two types.

Chronic Hypothermia

Hypothermia is not restricted to winter. It can occur any time temperatures fall to 60° F (16° C) or below and moisture is present. Amateur outdoor enthusiasts are most vulnerable to hypothermia, because most are urban dwellers who are not conditioned to physical stress. Many are unaware of the danger from cold, wetness, wind, and fatigue.

The four main elements present when chronic hypothermia occurs are described below.

1. Cold

Most hypothermia occurs between 30° F (-1° C) and 50° F (10° C).

2. Wetness

When cool temperatures are combined with rain, fog, snow, or perspiration, the chances of hypothermia increase considerably.

3. Wind

A slight breeze carries heat away from bare skin much faster than still air. This is the convection principle. This chill factor strains the body's efforts to stay warm. The wind will also evaporate water from wet clothing or skin, stealing more valuable body heat.

4. Fatigue

A victim does not have to be exhausted to suffer from hypothermia, but most fatal cases involve fatigue. When exhausted, the victim cannot voluntarily exercise to produce body heat. Eventually the body will not make involuntary adjustments, such as shivering, to maintain normal core temperature.

Hypothermia Symptoms

If heat loss continues, the core temperature will begin to fall below 99° F (37° C). As the temperature drops, symptoms will generally appear as follows:

Core Temperature	Signs and Symptoms
99° to 97° F (37° to 36° C)	Normal temperature range Shivering may begin
97° to 95° F (36° to 35° C)	Cold sensation, goose bumps, unable to perform complex tasks with hands, shivering can be mild to severe, skin numb
95° to 93° F (35° to 34° C)	Shivering intense, muscle incoordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert, unable to walk 30-foot line properly—**best field test for early hypothermia**
93° to 90° F (34° to 32° C)	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear and may be retrograde, gross muscle movements sluggish, unable to use hands, stumbles frequently, signs of depression

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90° to 86° F (32° to 30° C)	Shivering stops in chronic hypothermia, exposed skin blue or puffy, muscle coordination very poor with inability to walk, confusion, incoherent, irrational behavior, **but may be able to maintain posture and appearance of psychological contact**
86° to 82° F (30° to 27.7° C)	Muscles severely rigid, semiconscious, stupor, loss of psychological contact, pulse and respirations slow, pupils can dilate
82° to 78° F (27° to 25.5° C)	Unconsciousness, heartbeat and respiration erratic, pulse and heartbeat may be inapparent, muscle tendon reflexes cease.
78° to 75° F (25° to 24° C)	Pulmonary edema, failure of cardiac and respiratory centers, probable death (**Death may occur before this level.**)
64° F (17.7° C)	Lowest recorded temperature of chronic hypothermia survivor, Chicago 1951
48.2° F (9° C)	Lowest recorded temperature of induced hypothermia in surgical patient with survival, 1958.

Treatment of Chronic Hypothermia

When the body's core temperature reaches 95° F (35° C) or lower, the victim can no longer produce enough body heat for unaided recovery. Extreme and immediate measures must be taken to reverse the dropping temperature, because as the core temperature decreases, the rate of decline accelerates. A person can slip into hypothermia in a matter of minutes and die in less than two hours after the first symptoms.

An irrational victim may deny he's in trouble. Believe the symptoms, and act immediately!

Note: When in doubt about how serious a person's condition may be, treat him as though he were profoundly hypothermic.

1. Get the victim out of the wind and moisture and into the best shelter available.
2. Remove all wet clothes.
3. If the victim is showing only the initial stages:
   a. Administer warm, sugary drinks.
   b. Get him into dry clothes and a pre-warmed sleeping bag.
   c. Place well-wrapped, lukewarm water containers or rocks close to the victim.
4. If the victim is semi-conscious (in second or third stages):
   a. Try to keep him awake. Current procedures recommend no drinks at this stage.
   b. With his clothes removed, place victim in a warm sleeping bag (or improvised covers) with one or two other persons. Skin-to-skin is the most effective treatment.
5. Build a fire to warm the area.
6. If conditions allow, get the victim to a hospital as soon as possible. **Work fast.**

Alcohol should never be given to a hypothermia victim. It dilates blood vessels transporting blood to the skin's surface

and away from the body's core. Although a feeling of warmth may occur, there will actually be a loss of body heat. Alcohol also depletes the body's reserves because of the energy needed to metabolize it.

Acute Hypothermia

Since water can conduct heat 25 or more times faster than air, cold water immersion may cause a rapid loss of body heat and death can occur quickly. There are two phenomena associated with being immersed in cold water. One is the immediate disappearance syndrome, the other is hypothermia.

The immediate disappearance syndrome describes the person who falls into the water and is never seen again alive. Wearing a personal flotation device (PFD) is the only known protection for this type of accident.

The time it takes for hypothermia to take effect depends on how cold the water is as well as the physiological characteristics, behavior and clothing of the victim. In the water the areas of greatest heat loss are the head, neck, sides, and groin.

In cold water, assume a "HELP" position.

One way to reduce heat loss is to keep as much of the body out of the water as possible. Since most boats will float, even when capsized or swamped, getting in, on, or partially on the boat or anything that floats, will increase chances of surviving.

The key to survival in the water is conserving energy, or heat contained within the body. Your best chances of survival occur when you are wearing a PFD, keep your head out of the water, and assume a "HELP" (Heat Escape Lessening Posture) position. (See illustration.) HELP is a fetal position that protects the areas of highest heat loss—the head, neck, sides, and groin.

If there are several people in the water, huddling close together in a circle will help reduce individual heat loss. Any physical activity, such as swimming and treading water will increase the rate at which heat is lost.

Huddle close together to reduce heat loss in cold water.

In 55° F (12.7° C) water, it is estimated that only half of the people in the water may be expected to survive for more than 1½ hours if they are swimming. Floating, still in a PFD, this half may survive for 3½ hours, and assuming the HELP position, half may survive for 5½ hours.

Treatment of Acute Hypothermia

Victims of acute, or rapid onset, hypothermia should be rewarmed quickly. Since they were cooled quickly, their bodies probably did not have time to undergo dangerous biochemical or fluid changes. Rewarm the victim as quickly as possible by applying heat to the trunk of the body, excluding the extremeties.

Victims of acute hypothermia may be unconscious and not show vital signs, yet still be alive. Even if all signs of life are absent, no pulse, no blood pressure and the pupils of the eyes are fixed and dilated, cardio-pulmonary resuscitation

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should be administered. Therefore, a hypothermia victim should be declared dead only by a doctor, and then only when he has been rewarmed and does not respond.

This also holds true of a victim drowning in cold water, even if he has been immersed for a long time. This is especially true of children. A number of people have been successfully revived after being immersed for a considerable length of time.

FROSTBITE

Cold weather also contributes to frostbite, which occurs when parts of the body begin to freeze. Ice crystals form in the fluid and underlying skin tissues.

Frostbite is most common in the body's extremities and peripheral areas—the feet, hands, ears, and nose, in that order. Nerves, muscles, and blood vessel tissues also are very susceptible. Anyone exposed to temperatures below 32° F (0° C) may develop frostbite, especially the unprepared.

To help prevent frostbite, you should avoid wearing tight-fitting clothing that restricts circulation. Be sure to drink fluids, eat a balanced diet, and do not get overly tired. It is rare for a healthy person to develop frostbite.

To help prevent frostbite, you should avoid wearing tight-fitting clothing that restricts circulation. Be sure to drink fluids, eat a balanced diet, and do not get overly tired. It is rare for a healthy person to develop frostbite.

Symptoms and complications of frostbite are as follows:

First degree—Injury to surface skin, similar to sunburn. The affected part will show redness, swelling, burning, and tingling. No blister formation. Usually no tissue loss.

Second degree—Similar in appearance to first degree with a gray-white color. Blisters occur minutes to hours after injury. Undue redness of skin when rewarmed. Swelling.

Third degree—Damage or death to deep tissues. Much or all of the frozen part may be lost. Usually no blisters.

Fourth degree—Localized death of tissues, usually resulting in total loss of affected body part. No blisters or swelling.

If it's truly frostbite, you'll know. The frostbitten area will progress from severe pain to numbness. The area will be cold to the touch and may feel like a chunk of marble. All frostbite feels this way at first.

When the symptoms appear, seek help immediately, if possible. If you are far from help, don't try to thaw the part immediately. If it thaws and refreezes, the injury will be more severe than if the tissue were not thawed at all. While you should protect the frozen part, it may be necessary to walk on a frozen foot. Keep the part frozen until conditions are right to thaw it.

Do not rub a frostbitten area.

Don't use massage to restore circulation, and do not rub the injury with snow. Massaging or rubbing will increase the damage to frozen tissue. Snow also intensifies the damage.

When you reach a permanent shelter, place the frozen part in water that is between 98° F (37° C) and 104° F (40° C)—lukewarm to normal. *Never* let water temperature be higher than 115° F (46° C) or the results will be disastrous.

Do not put the affected part in a warm oven or too close to a heat source. When the part is frozen, it loses its sensory

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Note to instructor: *Advise your students to consult a doctor on proper treatment of frostbite.*

ability. A burn could be added to the frostbite without the victim feeling it.

A frostbitten body part requires about 20 to 45 minutes to thaw out in water that is body temperature. This will be very painful. Treat frostbite victims for shock by elevating the feet and lowering the head.

If blisters form, do not break them, and do not place bandages, salves, ointments, or anything else on the frostbitten area. If fingers or toes are involved, they may be separated by wedges of cotton. It may take several days or weeks before the amount of damage can be assessed.

Remember:
To survive exposure to the cold:
Slow down.
Stay dry.
Conserve energy.

FROST NIP

Frost nip, or superficial surface freezing, is most common on the ears and the tip of the nose. It is most evident by a frosty white or waxy appearance. Since it can be painless, a person may not realize what is happening unless someone else notices.

Warm and thaw the affected area immediately to avoid more serious frostbite. Cover your nose with your hand and blow warm air, warm your hands and place them over your ears, put hands inside mittens or blow on them, and put feet against warm human flesh, if possible. (This is when you discover just how good your friends are.)

Protect your eyes from the sun's glare on snow and ice.

SNOW BLINDNESS

Snow blindness is an inflammation of the eyes and sensitivity to light caused by exposure to ultraviolet rays reflected from snow or ice. This is a less serious, cold-related injury, but merits attention.

The glare from snow and ice can easily cause a painful, though temporary, injury to the eyes. Long exposures to the glare could result in permanent damage.

To treat snow blindness, victims should immediately be removed from the glare and should be placed in total darkness for at least 24 hours with cold compresses applied to their eyes. Victims should be cautioned against rubbing their eyes. Ointments or other eye solutions also should be avoided.

Effects of heat on the body

Among natural hazards, only winter's cold claims more victims than heat. Excessive heat is especially hard on persons with ailing or weak hearts, but it also saps the physically healthy—the jogger or gardener. The best prevention for heat illness during "dog days" is to avoid exertion and seek a cool spot.

HYPERTHERMIA

Hyperthermia, a rise in the body's core temperature, is the term applied to overheating. Heat problems can occur when either the air temperature or humidity is very high. Just as is the case with hypothermia, whenever moisture is present, the problem becomes particularly dangerous.

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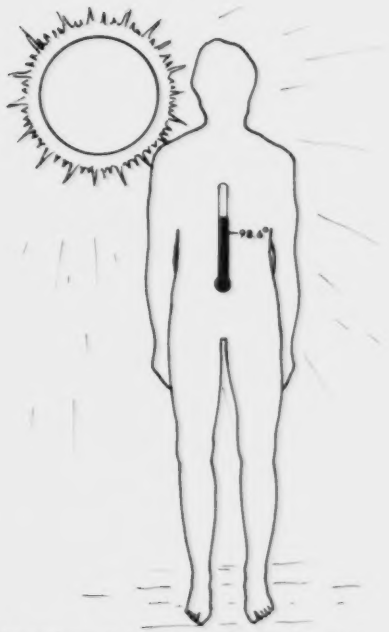

Hyperthermia is a rise in the body's core temperature.

The cooling process

Physical activity increases core temperature, and the more vigorous the exercise, the greater the heat buildup. As core temperature increases, the body directs greater blood flow to the skin in an attempt to keep the internal temperature at a constant level. The blood carries some of the internal body heat to the skin's surface, where it is dissipated by radiation into the cooler, surrounding air.

If the temperature is 90° F (32.2° C) or higher, however, the air is so warm that little or no heat can be thrown off by radiation.

The body then relies upon perspiration for cooling. This is actually the body's most effective means of throwing off heat, but sweating alone is not enough. The perspiration must evaporate for any cooling to take place, and that can't happen if the humidity is 75 percent or greater. That's why in summer it's important to wear clothing with a loose weave to allow ventilation. Wind can carry away excess body heat (convection) and reduce the danger of hyperthermia.

When these two main cooling mechanisms (radiation and perspiration) fail, dangerous overheating can occur. Sustained physical activity can produce risky, high core temperatures of 102° F (39° C) or more. At temperatures of 106° F (41° C) to 108° F (42° C), death can occur.

Water loss

Water loss is a related problem of excessive heat and humidity. All of the body's important chemical reactions are carried out in water and are significantly less efficient when an adequate amount of water is not available. If high fluid losses aren't quickly replaced, then dehydration occurs. The body's stores of water become seriously depleted and some important electrolytes, such as sodium, are also lost. Less water is available for the sweating process, so cooling becomes more difficult.

To compensate, water is taken from the blood, but this reduces the blood volume, leaving a reduced blood supply for the muscles and organs and to the skin for cooling. Also, with water removed from the blood, the concentration of electrolytes becomes abnormally high, which can upset normal heart rhythm.

If water loss continues, the body will shut down the sweating mechanism. This is a protective device to prevent more water from being lost from the blood. With the sweating mechanism turned off, skin becomes hot and dry, and the body can overheat very rapidly. The core temperature can climb to 106° F (41° C) in only 15 to 20 minutes.

COMMON HEAT INJURIES

Three serious heat injuries commonly occur—heat cramps, heat exhaustion, and, the most serious of all, heatstroke.

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Heat cramps

Heat cramps are the least serious, but still require immediate treatment. Painful muscle cramps occur as a result of the excessive loss of water and salts.

When a cramp develops, discontinue activity, try to ease the cramp with gentle stretching, and get out of the heat and into a cooler environment.

Take some salty fluids—a teaspoon of salt in an 8-ounce cup of water, for example. Postpone any physical activity for at least 24 hours.

Heat exhaustion

Heat exhaustion is more serious; this illness signals a dangerous depletion of fluids and salts.

Symptoms include profuse sweating, dizziness, confusion, fatigue, excessive thirst, dilated pupils, and cool, moist (clammy) skin. The body temperature may be slightly elevated, normal, or even subnormal. First-aid measures are the same as for heat cramps. In addition, remove clothing and bathe the body in cool water.

Heatstroke

Heatstroke, the most serious heat ailment, develops when the perspiration mechanism breaks down. It is potentially fatal and requires immediate medical attention. The high fever can lead to permanent brain, liver, and kidney damage.

Symptoms include a hot, dry skin (usually red), absence of perspiration, a rapid pulse, abnormal breathing, constricted pupils, faintness or unconsciousness, and a very high body temperature.

The body temperature must be brought down as quickly as possible. The victim should be removed to a cool, shady spot and placed on his back with head and shoulders slightly elevated. Remove clothing and rub the body with alcohol or water and ice. Fanning will assist the evaporation process. If the victim is conscious, give him cool water to drink.

In hot weather, rest frequently and try not to move about except during cooler hours or at night.

PREVENTING HEAT AILMENTS

Heat stress injuries are easily avoided. Some preventive measures are listed below:

1. Confine necessary movement to the cooler hours of the day or at night.
2. Dress appropriately and avoid exposure to direct sunlight. Use sunscreen to protect skin.
3. Reduce activity to the minimum.
4. Rest frequently if activity is necessary. (A study involving miners showed that when temperature and humidity rose to an uncomfortable level, their need for rest increased from their normal 7.3 minutes to 22 minutes per hour—three times as much!)
5. Replace fluids and salt. Since the thirst mechanism is blunted during exercise, thirst isn't a good indication of dehydration. Drink cool fluids with low sugar content. Water intake is helpful only after it leaves the stomach, and this will

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happen sooner if the sugar content is low. Also, the cooler the drink (within reason) the more rapidly it will be emptied from the stomach. A beverage of 45° F (7.2° C) to 55° F (12.7° C) is best.

Despite popular belief, few salt supplements are needed. Fluid replacement is more important. Any salty drink should be diluted, combining 1 teaspoon salt to 6 quarts of water. Several commercially prepared drinks are designed to replace electrolytes (Gator-Aid, ERD, and Quick-Kick, for example). These are useful, but check their sugar content first.

Safety tip:
Taking additional salt without abundant water can be very hazardous.

6. Avoid salt tablets except with large amounts of water. Excessive salt intake hurts more than it helps. Salt tablets can cause nausea and even greater fluid losses.

Fire Building

Knowing how to build a fire is important for coping with many emergencies. Fires generate light, warmth, signals, heat for cooking and drying clothes, and a boost to morale.

First, however, determine whether a fire is necessary and safe. Do not start a fire when you are too near flammable materials, such as gasoline or oil, or when dry vegetation surrounds the fire area. (A human cannot outrun a full-blown grass or forest fire.)

In an emergency situation, you should begin building a fire two to three hours before dark and collect two to three times as much wood as you think you need.

Build your fire only as large as is necessary. A small fire is a more efficient source of heat than a large fire, because you can get closer for warmth. Smaller fires also work better for cooking, and they use less fuel (thus saving your energy).

Fires require a source of ignition, oxygen, and fuel.

Steps to build a fire

Note to instructor: *In an actual survival situation, impact should be of little concern.*

1. Select a safe area away from overhangs, snow, limbs, or flammable materials and near a source of firewood. If possible, build your fire in a manner that will cause minimal impact on the natural area. (Refer to the *Backpacking* and *Campground Cookery* modules for more information.)

2. Clear a 5- to 6-foot circle down to the mineral soil. Leave no roots or duff underneath. (If there's a lot of snow, you can build a fire on a platform of logs and sticks.)

3. Gather fuel before starting the blaze. Collect twice as much as you think you will need.

4. Organize the materials into three piles.

A. **Tinder**—Extremely flammable materials used to catch the initial ignition. For example: pitch, grass, fine-textured bark, wood shavings, gasoline, "fuzzed" cigarette filter, cotton, hair, fine steel wool, latex rubber, gauze, toilet paper, or coarse sawdust dampened with turpentine.

Editor's note: *The* Campground Cookery *module is part of the Outdoor Living Skills series. To obtain a copy, contact your outdoor skills education specialist or write the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.*

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Tinder

Kindling

Fuel

B. **Kindling**—Anything that will burn from the flame started by tinder. For example, a candle, oil with a wick, small dead twigs, red needles of evergreens, paper, pieces of dry wood smaller than a pencil. The smaller the material, the more combustible.

C. **Fuel**—Wood that will not burn from a single flame. For example, wood larger in diameter than your little finger, charred wood, chunks of bark, wet wood, tires. Burning green wood is not advised, except to create heavy smoke signals.

5. Start small and build.

A. Use a heat source to ignite the tinder. The ignition could come from a match, a butane lighter, battery sparks, flint and steel, or a parabolic reflector.

B. After a flame is started, feed the fire slowly with kindling. Be careful not to snuff out the flame. A candle is helpful at this stage to keep the fire burning. Gradually build a good blaze.

C. Increase the size of the fuel from small sticks to branches, then limbs and logs. Fan the blaze with a plate, hat, or other object.

D. If it's raining, improvise a cover for the area that will allow the fire to get started.

Types of fires

Many forms of fire construction have developed over the years. Three are outlined here.

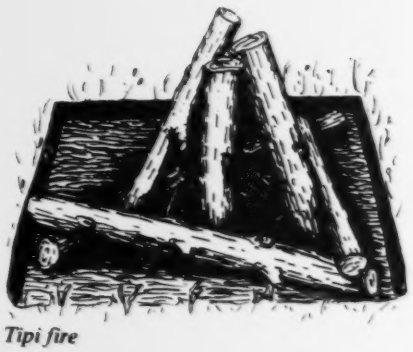
The **tipi fire** is the easiest to build and most versatile. Tinder is placed in the center and ignited. Kindling is added one piece at a time in tipi fashion until it is also ablaze. Then fuel is placed around the fire in similar fashion. The tipi shape allows for circulation of oxygen.

From the basic tipi fire, other styles can be constructed. The **log cabin fire** is used to produce a good bed of coals.

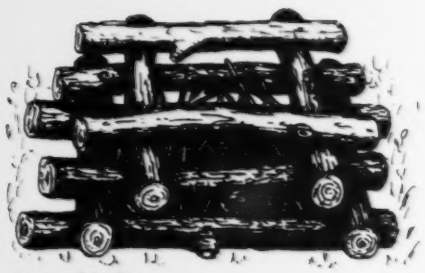
In case of high winds, build a trench or **pit fire** with a crosswind opening. (Use the tipi method in the pit or trench.)

When conditions are muddy or snowy, a platform of non-combustible material, such as green logs or rocks, should support the fire. In the case of snow, the platform will prevent the fire from sinking into the snow and being extinguished.

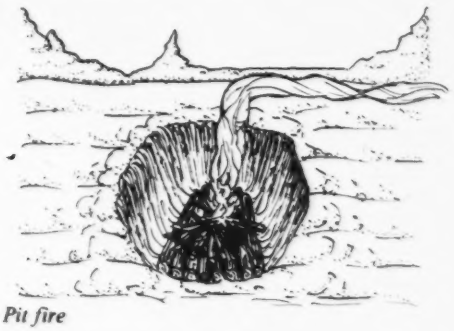
Be careful if using rocks for the platform. Rocks found in or near water will often explode when exposed to the extreme heat of a fire.



Tipi fire



Log cabin fire



Pit fire

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You may also want to build a reflector to direct heat or to block wind. Stacking logs, limbs or rocks to form a wall near the fire will make a good reflector. To double the benefit, use wet wood for the reflecting wall. The fire can dry the wood while the wall reflects the heat.

To extinguish the fire, pour on water and dirt and make a mud pie. The fire should not be considered out until the entire site, above and below, is cool to the bare hand. A spark could smolder in duff for days before reigniting.

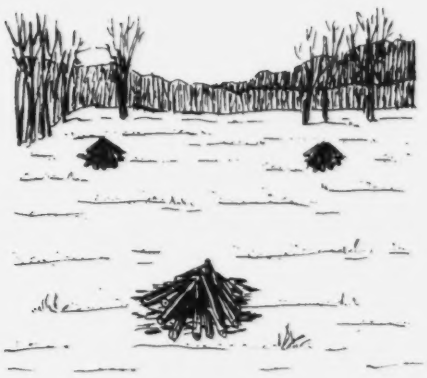
Signaling

The key to signaling is creating contrast, making a radical change in the character of the environment.

Fire, smoke, ground markings, and whistles are all forms of signals. When in trouble, you should try as many as possible. The more signaling efforts you make, the greater your chances of attracting the attention of a rescue party.

A clearing is the best area for a signal. Try to pick an area that allows signals to be seen from all directions, and work away from trees, which can dissipate smoke signals.

Signal fires



Set three fires in an equilateral triangle.

Building signal fires is one good method. During daylight hours, fires should be smoky to attract attention. White smoke, produced by throwing water or green vegetation on a hot fire, contrasts with dirt or foliage. Black smoke, produced by adding petroleum or rubber-based products to a fire, will show up well against snow or other light-colored terrain.

A hot fire will produce high-rising smoke—the hotter the fire, the higher the smoke will rise. Always have plenty of materials at hand for fast signaling in case a plane or search party is heard. A blaze is needed for night signaling, but remember that most search missions are halted at dark.

The best method is to lay out the fires in an equilateral triangle—three separate fires over a sizable area. This may not be feasible, however, if it requires too much energy to man them. Also, do not spend energy traveling to an ideal signaling area unless it is impossible to signal properly in the immediate area.

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Ground to air

Ground-to-air symbols are a second method of signaling. A standardized code for ground-to-air symbols is reproduced at left. These letters and figures should be 60 feet or longer to be readily visible to air traffic.

If you can't remember the proper ground signal, try "SOS," the international signal, or the letter "X," which works well because straight lines are rare in nature.

The signals can be stamped into grass or snow or dug into sand and soil. You can also make them from any objects which differ from the dominant background.

Standardized Code

1. *Require doctor—serious injuries*
2. *Require medical supplies*
3. *Unable to proceed*
4. *Require food and water*
5. *Require firearms and ammunition*
6. *Indicate direction to proceed*
7. *Am proceeding in this direction*
8. *Will attempt to take off*
9. *Aircraft badly damaged*
10. *Probably safe to land here*
11. *All well*
12. *Require fuel and oil*
13. *No—negative*
14. *Yes—affirmative*
15. *Not understood*
16. *Require engineer*
17. *Require compass and map*
18. *Require signal lamp*

If you can't remember the right ground signal, make an "SOS."

Audible signals

Audible signals are worth a try just in case someone is within hearing distance. Make three loud noises in quick succession, followed by a pause, then three more blasts or shots. Any noise will do, but yelling requires considerable energy and should be a last resort.

Visual signals

Visual signals, such as mirror reflections, flags, trail markers, and direction-of-travel symbols, also help rescue attempts.

Any highly polished surface has reflective qualities. Don't overlook glass panes, aluminum foil, or other shiny surfaces, especially if an air search is expected.

Direction-of-travel sign made from sticks

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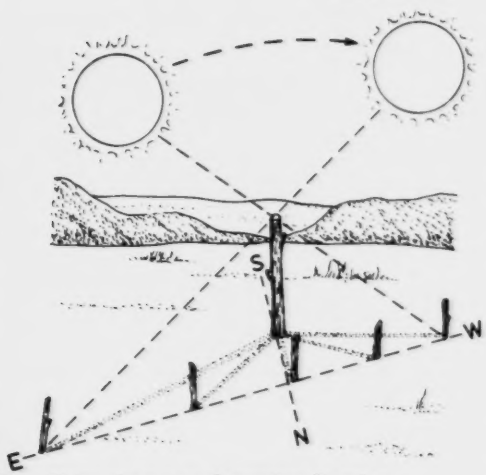
Direction Finding

Editor's note: *The* Map and Compass *module is part of the Outdoor Living Skills series. To obtain a copy, contact your outdoor skills education specialist or write the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.*

Outdoor travelers usually begin their outings with a map and compass to point the way. (See *Map and Compass* module.) But in an emergency, these navigational aids might not be available. This unit will concentrate on the methods for discovering direction without modern navigation tools.

To repeat, travel is not advised and should be considered a last resort.

The sun



Using the sun to determine direction

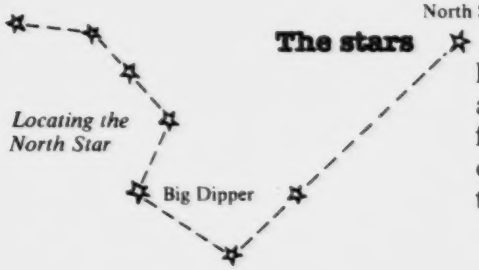
The sun, when visible, is the best natural directional reference. It rises approximately in the east and sets in the west, though latitude, longitude, and season will affect this. Three methods for establishing direction with the sun are described below.

1. Place a stick vertically in flat ground. Starting in the morning, mark a point at the tip of the stick's shadow about every hour. At the end of the day, draw a line connecting the marks. This line will run east-west. The shortest distance from the base of the stick to this line will be north-south.

2. Note the shadow of a vertical stick at precisely noon or when the sun is straight overhead; it will point north-south. Even if the day is overcast, the sun will cast a faint shadow.

3. Point the hour hand of a watch, set at the correct local standard time, toward the sun. Midway between the hour hand and the 12 will be south. (Note: When the sun is high, this method is not very accurate.)

The stars



Locating the North Star

On a clear night, the stars can provide direction. First, locate the Big Dipper constellation (Ursa Major), which appears as a large saucepan. The two stars on the side farthest from the handle will point to a bright star, known as Polaris or the North Star. This star is always within one degree of true north.

Other natural clues

Many other natural signs indicate direction. Limbs on lone trees in the open generally are heavier on the south, and ant hills usually are built on the warmer, south side of trees and other objects.

Prevailing winds can give direction, although it helps to know the geography of the country and seasonal weather patterns.

Heavier vegetation often grows on northern slopes, but this is not a reliable test. And never depend upon moss to grow only on the north side of a tree. It actually favors the shaded side, which varies from place to place.

Travelers should know how to use a map and compass and carry them when traveling. Research area weather and topography before any venture. Always look at a map of the

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Believing in an "innate sense of direction" can get you lost.

area and know what is due north, east, west, and south. That way you know which direction to travel or not to travel. When lost or stranded, travel only as necessary and mark your trail frequently in case you have to backtrack.

Don't believe in an innate sense of direction. It's a myth. Without assistance, most humans will walk in a circle. To ensure travel in a straight line, pick two obviously distant landmarks exactly on the line of travel. Walk to the first, then, before reaching the second, pick another. When you stop, face the direction of travel. Mark your trail. Be prepared to detour and try to calculate where you will come back on course by counting your paces and making 90-degree turns. Be sure to look back as you go so you can recognize the trail and landmarks if you must backtrack.

Try to stay on high ground. Following a downstream path along a river or creek usually will lead to habitation, but it could also lead to natural obstacles. If you become lost, don't panic. Stop, think, and maintain a positive mental attitude.

Emergency Kits

"Anticipate the best, but expect the worst" is good advice for anyone venturing away from home or a campsite. Being without a pack or provisions when trouble strikes is no fun. And survival with only the clothes on your back is not easy. (A good test would be to sleep in your backyard one night, wearing only the clothing you would have on a typical outing.)

Carrying an emergency kit makes good sense for everyone. And it's easy to assemble an inexpensive set of necessities for your pack or the glove compartment of your car. (Just remember to take the kit with you on all side trips.)

What you need

Listed are some items to consider for your kit.

SHELTER

1. A plastic tube, 8 feet long by 40 inches flat, is probably the best emergency shelter. To construct one, take two of the largest garbage bags you can find, cut the ends out, and tape them together with electrical tape. Try it out. It will allow condensation, so, as humidity increases, open it and allow air to circulate. The tube helps retain body heat and protects from wind, cold, and moisture.

Two garbage bags taped together can make a good emergency shelter.

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2. A flat plastic sheet, 8 feet by 7 feet, of 1 or 1.5 millimeters thickness.

3. In desert areas, a "space blanket" is helpful. It protects from the sun during the day, yet provides a fairly good blanket at night.

Fire-starting devices

FIRE STARTING

1. At least one hard wax plumber's candle about 4 inches high. (Two are better.)

2. "Strike-anywhere" wooden matches, waterproofed with a light coat of paraffin or fingernail polish.

3. A waterproof match container, cylindrical and with a flint bottom, is a good item.

4. Small plastic bottle filled with coarse sawdust dampened with turpentine.

5. Heat tabs (or similar chemical fire heat source). Be cautious about toxicity.

6. Anything that will burn longer than a match after it is lit from a match. (Some natural resources may be available, such as resin.)

7. A butane lighter.

DRINKING

1. Small, non-toxic metal container(s).

2. Aluminum foil—1 to 2 feet wide by 2 to 4 feet long is ideal. Fold in accordion pleats and roll lengthwise around kit container. This prevents small punctures which form when foil is folded into squares. The foil can be used to form a pot for heating water. (It also can serve as a reflective device or trail marker.)

3. Include bouillon, tea, coffee, soups, sugar, and honey to add flavor and calories, and to build morale.

A whistle is a good means of signaling.

SIGNALING DEVICE

1. A shrill-sounding plastic whistle with a strong string, to be worn around the neck.

2. Reflective device. (Metal mirror is preferable to a glass one. Aluminum foil or other brightly polished metal surfaces will also work.)

Small knife with sharp blade

CUTTING TOOL

1. A small knife with sharp blades. (Sharp blades are safer and more efficient than dull blades.)

2. Single-edged razor blade or scalpel.

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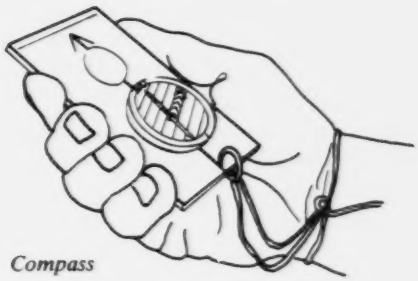
MEDICAL SUPPLIES

Two to three feet of 1-inch surgical tape.
Four or five adhesive bandages.
Two safety pins.
Aspirin.
Antiseptic for cleansing.
Money for a phone call in case you are near a telephone.



Compass

DIRECTION FINDING

Map and compass. (Remember, however, that travel is not suggested. A cardinal rule of survival is to **stay put for at least seven days.**)

KEEP IT WITH YOU!

Seal the kit with a strong tape and wrap it in a plastic bag to prevent any moisture damage to the contents. Devise a comfortable way to carry it, perhaps with an improvised belt holder. Always carry it!

Become familiar with how to use each item in case you have to depend upon them in an environmental emergency. (See Appendix 3 for a sample emergency kit recommended for a car or truck.)

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Editor's Note: *Some of the activities included as part of the lesson plans were developed by Dr. Charles M. Chase, who has a broad background in outdoor education and survival skills. He served as a survival instructor in the United States Air Force where he taught survival skills to astronauts, Green Beret Forces, underwater demolition teams and air crew members of Combat Flight Groups.*

His formal instruction includes a doctorate in curriculum and instruction with an emphasis in outdoor education. As part of the outdoor education and curricula at universities, he has taught many courses ranging from Foundations of Outdoor Education and Resident Outdoor Education to specialty courses such as Night Navigation, Cold Weather Survival, Wild Edible Plants, and Outdoor Adventure Education. He is a Master Instructor in Primitive Skills and Adventure Education for the Missouri Department of Elementary and Secondary Education. Currently, Dr. Chase is developing outdoor education instructional aids for Outdoor Products and Programs in Red Wing, Minnesota.

Introduction

The following lesson plans are offered as a suggested and field-tested means of teaching this subject material. Times are estimated for a 50-minute class period; however, the time needed for each lesson may vary depending upon the teacher and class. Appropriate curriculum areas also are suggested.

The lesson plans greatly expand the content material by providing a variety of activities that would be useful if attempting to survive an environmental emergency. Some of these activities also are good exercises for youth groups on field trips or overnights.

Whenever films are suggested as a teaching aid, a list of questions are included for the film. These should be given to students *before* they see the film to aid comprehension. After showing the film, initiate discussion by having students answer the questions.

The lesson plans are organized so they address the priorities for surviving an environmental emergency.

No. 1

Title: Introduction: Psychology of Survival

Method: Lecture, class discussion, class exercise

Time: One 50-minute period

Purpose: To introduce the principles of coping with an environmental emergency.

Curricula: Physical Education, Psychology, English, Science, Social Studies

Instructional Aids: Student handout (Appendix 1). Newspaper clipping of actual natural emergency.

Facilities: Classroom

Outline:

I. Introduction
   - A. Hand out the environmental emergency situation in Appendix 1.
   - B. Explain instructions to the class and have them complete the exercise.
   - C. Discuss each item and how it might be used during an emergency such as the one described.
   - D. Compare students' answers to those on the instructor's key. Determine whether they would have survived the emergency.

II. The Importance of Being Prepared
   - A. Those accustomed to the comforts of the artificial environment (where most of us live and work) should not enter the natural environment unprepared for the unexpected.
   - B. Accidents, breakdowns, and storms can occur at any time.
     1. Southern Missouri was paralyzed by a snowstorm on March 26, 1978.
     2. Kansas City's flash flooding of 1977 claimed 18 lives.
     3. In the spring of 1986, tornadoes destroyed large areas of southeast Missouri.
   - C. Many deaths occur that could have been prevented if the victims had been prepared.
     1. Victims could have avoided the potentially dangerous situation in the first place.
     2. Victims could have had tools for survival at hand.

III. Definition of Terms
   - A. Word "survival" often carries context of adventure and curiosity. Simply defined, it is existence, or keeping the body alive.

B. This unit is named "Environmental Emergency Preparedness" to show that the emphasis in surviving outdoor emergencies will be on becoming prepared.

IV. Fallacies of "Survival"

A. Most emergency experiences are short-term, lasting less than 72 hours. Longer situations are frequently the result of mistakes by the victim.

B. Finding food is not the first priority.

1. Humans can live on body fat for three weeks or longer.
2. Usually it will take more energy to gather plant foods than the body will gain from eating the plants.
3. Danger exists of consuming toxic plants.
4. Victims should try to conserve energy.

C. Confidence can do more harm than good.

1. Confidence may be shattered with small failures.
2. Confident victims may overestimate their abilities, resulting in bigger problems.
3. Better to maintain a "positive mental attitude"—to stay calm, analyze problems, make rational decisions.

D. Don't count on equipment. Your body is the only thing you are guaranteed to have with you during an emergency.

1. Equipment can fail.
2. You may not have what you need.
3. You may not know how to use what you have.

No. 2

Title: Examples of Emergency Situations

Method: Film and class discussion

Time: 50 minutes

Purpose: To show specific examples of how a fun-filled outdoor excursion can end in tragedy when ignorant mistakes are made.

Curricula: Physical Education, Health, Social Studies, Psychology, English, Science

Instructional Aids: Film "Survival," projector, screen

Facilities: Classroom that can be darkened

Outline:

I. "Survival" film (25 minutes)
Before showing film, give students the following questions to be ready to answer and discuss after the film has been shown.

A. Fishing sequence
1. What were the weather conditions?
2. What mistakes did the fisherman make?
3. What is the No. 1 Killer in the outdoors?
4. What did he need to survive and where was it?
5. What is the only symptôm of hypothermia you'll recognize and what must you do?
6. How do you prevent hypothermia?

B. Hiking sequence
1. What mistakes did the group make?
2. What killed the family?
3. Why should you check the local weather?
4. What do you include in an emergency kit?
5. What is the most important survival tool that you have?

C. Desert sequence
1. What happened and what mistakes were made?
2. What effect did the heat have?
3. Why should you not drink alcohol?
4. What are the general rules for surviving in the desert?

D. Hunting sequence
1. What mistakes were made?
2. What happened when the hunter panicked?
3. What should he have done?

E. Summary
1. Why are most mistakes made in the outdoors?
2. What do you do if you get lost?
3. What does building a fire do?

Note to instructor: *To borrow a copy of the "Survival" film, contact your outdoor skills education specialist.*

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II. Class Discussion
Discuss the questions with your students. Tell them to keep the answers to these questions in mind as they study this unit.

No. 3

Title: Psychology of Survival: Common Fears and Stresses

Method: Lecture, class discussion

Time: 50 minutes with extra time for optional activities

Purpose: To emphasize mental control in an environmental emergency and to identify common fears and stresses which could influence ability to survive.

Curricula: Psychology, English, Physical Education, Social Studies, Science

Instructional Aids: Visual aid with S-T-O-P acronym

Facilities: Classroom

Outline:

I. Psychology of Survival
   A. Brain is best survival tool.
   Survival during crisis is 80 percent mental, 10 percent skill, and 10 percent equipment.
   B. Stresses from home or work are not priorities during emergency.
   C. Concentrate on will to live. Maintain a *positive mental attitude*.
   D. Make decisions based on priorities of air, shelter, water, and food, in that order.

II. Stresses That Can Affect Ability to Survive
   A. Fear and anxiety
      1. Types of fear
         a. Of being alone—"No one to help me."
         b. Of darkness—"What's out there?"
         c. Of strange environments—"Never had to deal with this before."
         d. Of society—"What will people think?"
         e. Of suffering—"I can't stand to be cold."
         f. Of death—"I don't want to die out here."
         g. Of not being found—"They won't come look for me."
         h. Of animals—"What if a bear comes at me?"
         i. Of your own weaknesses—"I just can't do it."

2. Fear can be helpful
    a. Increases awareness
    b. Gives unexpected energy from adrenaline
3. Symptoms of fear
    a. Rapid pulse
    b. Wet palms
    c. Dry mouth
    d. Trembling
    e. Butterflies
    f. Irritability
    g. Confusion
4. Controlling fear
    a. Keep busy, mentally and physically
    b. Look around, stay aware of surroundings
    c. Turn to personal religion

B. Stresses of cold and heat (further discussion later in module)

C. Thirst
1. Body can live about three days without water.
2. Do not allow thirst to become an obsession.
3. Water is almost always available.
4. Limit physical activity. Ration sweat, not water.

D. Hunger
1. Body can live three weeks or more without food.
2. Feeling of hunger is mostly psychological. As discomfort decreases, the urge for food increases.
3. Do not worry about finding food until all other problems are taken care of—shelter, fire, water, and signals, for example.

E. Loneliness and boredom
Maintain positive mental attitude.

F. Sleep deprivation or fatigue
Rest often, even if you are unable to sleep.

G. Panic
1. Control panic with the S-T-O-P acronym.
S—Slow down, sit down.
T—Think, analyze the weather, terrain, or available resources.
O—Observe, inventory potential resources.
P—Plan actions that will make the best use of your energy.
2. Now you are ready to act!

III. Optional Activities

A. Have students read *Alive* or another appropriate book.

B. Develop discussion questions and activities based on what they read. The following are suggested for the book *Alive*.

Editor's Note: *There are many good books that address the theme of psychologically and physically surviving environmental emergencies. Piers Paul Read's book* Alive: The Story of the Andes Survivors *can be used to help students better understand psychological stresses and the importance of maintaining a positive mental attitude. The book cites an extreme example, but its story can be an effective teaching tool.*

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Note to instructor: *The class discussion questions and activities for this literature assignment have been developed using Benjamin Bloom's learning taxonomy. Levels of thinking are: knowledge, comprehension, application, analysis, synthesis, evaluation.*

1. *Level of Thinking: Knowledge*
   a. Class discussion: Trace the actions of the survivors immediately after the crash, throughout the first day, and during the following weeks.
   b. Class activity: Write a list of the major daily events for the first week after the crash. Then list weekly activities as they pertained to the priorities for life.
2. *Level of Thinking: Comprehension*
   a. Class discussion: Describe the circumstances of the survivors as far as air, shelter, water, food, drugs, and radio communication were concerned.
   b. Class activity: Imagining that you are one of the survivors, write an entry in your journal as to how you assess your chances for survival given the things that are available after the crash.
3. *Level of Thinking: Application*
   a. Class discussion: Apply some of the principles for coping with an emergency to what actually happened in this survival situation. (For instance, how did the psychological states of the survivors differ? Identify ways they improvised.)
   b. Class activity: Interview someone who has survived a tragic event and ask them what techniques they used to endure the ordeal. What did they learn?
4. *Level of Thinking: Analysis*
   a. Class discussion: Analyze the changes in the mood of the survivors as the days passed. What effect did a positive mental attitude have—for individuals and the group? What part did their religious beliefs and backgrounds play in attitudes and actions?
   b. Class activity: Pick one person who survived until rescued and graph his mental state as it is described throughout the book. Then write an explanation of why you think he survived.
5. *Level of Thinking: Synthesis*
   a. Class discussion: Imagine that you were one of the survivors and predict what your reaction would have been to the alternative chosen by the survivors to keep from starving to death.

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b. Class activity: Imagining that you are one of the survivors, write a statement to be made at a news conference in which you explain how and why you survived.

6. *Level of Thinking: Evaluation*
   a. Class discussion: Assess the actions of the survivors and discuss what you think they did that was right and what mistakes you think they made. What would you have done differently? Justify your answers.
   b. Class activity: Write a research report contrasting and comparing the actions of the survivors of the Andes plane crash with other situations such as:
      (1) Mary Drapers Ingles escape from the Indians in *Follow the River* by James Alexander Thom.
      (2) The main character in Jack London's "To Build a Fire."
      (3) The expedition party in *Annapurna* by Maurice Herzog.
      (4) Victims of the Holocaust, Hiroshima, or other accounts documented in literature.

No. 4

Title: Field First-Aid/Self-Aid for Bleeding

Method: Individual or group pre-field and in-field activity.

Time: 50 minutes

Purpose: To enable the student to better improvise materials to stop bleeding—a high priority life-sustaining operation

Curricula: Physical Education, Health

Instructional Aids: Only items that are normally found at the scene. This lesson focuses on improvisation.

Facilities: Anywhere—classroom, field site, or en route.

Outline:

I. Introduction
   A. Cuts and burns are most common outdoor injuries.
   B. Cuts are more serious, especially if bleeding is uncontrolled.

Note to instructor: *These techniques will handle most cases of uncontrolled bleeding. Extreme situations, such as amputation, may require additional techniques.*

II. Controlling Bleeding
   A. Direct pressure
      1. Immediately apply enough pressure with fingers or hand upon cut to make the blood flow cease.
      2. Follow the direct hand pressure with pressure dressings. The dressings can be dry, soft, bulky pieces of fabric that are folded to adequately cover the wound. (Examples: handkerchiefs, socks, T-shirts, piece of clothing, stocking hat)
      3. Place the dressing on top of the wound and secure it with a bandage. (A bandage is anything that holds a dressing in place—a strip of fabric or a piece of cord, for example.) Do not use a bandage that is too thin, such as a piece of wire. This could shut down or impair a blood vessel and cause more damage. If you are unable to find a wider bandage, then place a dressing under the bandage to cushion the area from further harm.
      4. Do not remove the dressing until you're absolutely certain that the bleeding has stopped. The dressing may become soaked with blood if the applied pressure has been inadequate. In this case, leave the original dressing in place, add more dressing, and apply more pressure.
      5. Monitor the patient for good circulation. Depending upon the location of the injury, check toes or fingers for warmth, normal color, and feeling. If these signs are absent, slightly loosen the bandage. Be careful not to allow bleeding to begin again.
   B. Elevation
      1. Use elevation in conjunction with direct pressure to control bleeding.
      2. The wound site should be higher than the heart. Raise the limb or lower the body, whichever is appropriate.

III. Student Activity
   A. Simulate an injury situation. State what the problem is and where the bleeding is occurring.
   B. Have students use their imaginations and any available resources to gain control of the bleeding.

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C. Here's a checklist for their actions:
   1. Prompt attention
   2. Dry, bulky dressing
   3. Adequate size
   4. Adequate pressure
   5. Good bandaging
   6. Elevation
   7. Check circulation
   8. Check color
   9. Check warmth
   10. Check feeling

No. 5

Title: Effects of Cold on the Body

Method: Lecture, class discussion, class exercise

Time: Two 50-minute periods

Purpose: To make students aware of the dangers of cold, the injuries that can result, and their treatment.

Curricula: Physical Education, Science, Health

Instructional Aids: Review materials from *Basic Principles* module, Wind Chill Chart (see Appendix 2).

Facilities: Classroom

Outline:

I. Introduction
The second priority for life is shelter, which can be anything used to protect the body against the elements. Shelter is particularly important to prevent hypothermia.

II. Hypothermia (exposure sickness)
   A. Occurs when body's core temperature of 98.6° F (37° C) is lowered.
   B. Particularly common among older persons, who are more vulnerable to cold injury.
   C. Two types—chronic and acute
      1. *Chronic hypothermia*, or long onset, is associated with being exposed to cold weather for a time that may range from a few hours to several days. It is generally caused by inadequate preparation and the victim's overestimation of his ability to withstand cold.

2. *Acute hypothermia*, or rapid onset, is associated with immersion in cold water. Since water can conduct heat 25 or more times faster than air, acute hypothermia may begin to develop in as little as 10 to 15 minutes or take several hours.

III. Conditions That Lead to Hypothermia

Note to instructor: Ask students to recall the film they saw on survival. What situations in the film led to hypothermia? What were the weather conditions in each situation? What should the victims have done differently?

A. Cold—any temperatures 60° F (15.5° C) or below. Most cases occur when temperature is 30° F (-1° C) to 50° F (10° C).

B. Wetness—such as fog, snow, or perspiration, greatly increases the chances of hypothermia. Immersion in cold water can be extremely dangerous.

C. Wind—even slight breezes carry heat away from bare skin much faster than still air (convection principle).
   1. Air temperatures combined with wind speed produce a wind chill factor on exposed flesh.
   2. Wind channels cold air under and through clothing and evaporates moisture from the body surface.

D. Fatigue—usually a factor in severe hypothermia cases, because victim is too exhausted to voluntarily exercise to produce body heat.

IV. General Symptoms of Chronic Hypothermia (These will vary.)

Note to instructor: Remind students that the only symptom they will recognize is shivering, so they must act quickly.

A. 99° to 96° F (37° to 35.5° C)
   1. Intense, uncontrollable shivering
   2. Impaired ability to perform tasks

B. 95° to 91° F (35° to 32.7° C)
   1. Violent shivering persists
   2. Speech becomes difficult
   3. Sluggish thinking
   4. Lack of coordination

C. 90° to 86° F (32.2° to 30° C)
   1. Shivering is replaced by muscular rigidity
   2. Blue or puffy skin
   3. Erratic or jerky movements
   4. Dulled thinking or amnesia

D. 85° to 81° F (29.4° to 27.2° C)
   1. Irrationality
   2. Stupor
   3. Slowed pulse and respiration
   4. Victim may be unable to stand or walk

E. 80° to 78° F (26.6° to 25.5° C)
   1. Unconsciousness
   2. Reflexes may cease to function
   3. Erratic heartbeat
   4. No response to spoken word

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F. Below 78° F (25.5° C)
   1. Failure of cardiac and respiratory control centers in brain
   2. Heart failure
   3. Probable edema and hemorrhage in lungs
   4. Death

V. Chronic Hypothermia Treatment
   A. When early symptoms appear, work fast.
      1. Get victim out of wind and into best shelter available.
      2. Remove wet clothes. Replace with dry clothing and place victim in a sleeping bag, pre-warmed by another person.
      3. Place warmed rocks or containers of warm water next to victim.
      4. Insulate victim from cold ground.
      5. Administer warm, sugary drinks.
   B. If victim is semi-conscious,
      1. Try to keep him awake.
      2. No drinks recommended at this stage.
      3. Leave victim stripped and place in sleeping bag or other improvised covers. Skin-to-skin contact with one or two other warm persons is most effective treatment.
   C. Furnish fire or other external heat source.
   D. Do not give alcohol.
      1. This dilates blood vessels and transports blood away from body's core.
      2. Also depletes body's reserves because of energy needed to metabolize it.
   E. If conditions allow, rush victim to hospital.

VI. Cold Water Survival
   A. Conserve energy. (Don't swim or tread water if you can keep from it.)
   B. Keep as much of the body out of the water as possible. Get on top of boats or other floating objects.
   C. Wear a Personal Flotation Device (PFD).
   D. Assume a HELP (Heat Escape Lessening Posture) position.
      1. HELP is a fetal position that protects the areas of highest heat loss—the head, neck, sides, and groin.
      2. If there are several people in the water, huddling close together in a circle will help reduce individual heat loss.

VII. Acute Hypothermia Treatment
   A. Rewarm victims quickly by applying heat to the trunk of the body, excluding the extremities.
   B. Even if all signs of life are absent, administer CPR.
   C. Only a doctor should declare a victim dead.

Note to instructor: *The U.S. Coast Guard has a slide series with instructor's guide available on "Hypothermia and Cold Water Survival." To obtain a copy contact the National Audiovisual Center, General Services Administration, Washington, D.C. 20409.*

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VIII. Other Cold Injuries
- A. Frostbite occurs when body tissues are exposed to temperatures below the freezing point, and ice crystals form in fluid and tissues.
  1. Symptoms may include tingling, pain, then numbness.
  2. Area first appears red, then pale.
- B. Frostbite treatment
  1. Protect the frozen part. Do not use it.
  2. Do not massage the area or rub it with snow. This will increase the injury.
  3. When you reach shelter, place the frozen area in water that is lukewarm to normal (98° to 104° F or 37° to 40° C)
  4. Expect pain as the body part thaws. Thawing will take 20 to 45 minutes.
  5. Do not hold the frozen area inside an oven or too near a fire. The victim could be burned without feeling it.
- C. Snow blindness—temporary eye injury due to excessive exposure to reflected glare of snow
  1. Treatment requires removal from glare.
  2. Victim should be in total darkness for at least 24 hours.
  3. Apply cool compresses to the eyes.
  4. Avoid rubbing eyes or administering ointments.

IX. Prevention of Cold Injuries
- A. Wear adequate, layered clothing.
  1. Wool is best for cold climates. Don't wear jeans.
  2. Outside garments should be waterproof and wind resistant.
- B. Always carry matches in a waterproof container.
- C. Seek shelter from cold and wind.
- D. Stop at first signs of hypothermia and build a fire.
- E. Conserve energy.
- F. Beware of overheating, wetness, and chill.

X. Optional Student Activity
- A. Have students read Jack London's short story "To Build a Fire" and answer the following questions:
  1. What characteristics about the newcomer made him susceptible to getting into trouble?
  2. Trace the mistakes made by the main character as he traveled. What physical signs did he ignore?
  3. Why did the man know he must build a fire after he became wet?
  4. Describe the man's psychological state from beginning to end.
  5. Knowing what you know, what would you do differently than the character in the story?

B. Have students read John Muir's short story "An Adventure with a Dog and a Glacier" and compare and contrast this story with the other story.
   1. What was the orientation of each man to nature?
   2. In what ways was the Alaskan terrain threatening to both men?
   3. What was the relationship of each man to his dog?
   4. Why do these stories have such different endings?

No. 6

Title: Effects of Heat on the Body

Method: Lecture, class discussion

Time: Two 50-minute periods

Purpose: To make students aware of the detrimental effects of heat on the body and to explain how to prevent heat injuries.

Curricula: Physical Education, Science, Health

Instructional Aids: Review materials from *Basic Principles* module. Materials needed for student activities.

Facilities: Classroom

Outline:

I. Hyperthermia (overheating)
   A. Occurs when body's core temperature rises.
   B. Elderly are especially vulnerable.
   C. Persons with weak hearts also susceptible.

II. Conditions Related to Hyperthermia
   A. Temperatures of 90° F (32.2° C) or higher
      At this point, the air is so warm that the body can no longer throw off heat by radiation.
   B. Relative humidity of 75 percent or greater
      At this level, the moisture in the air prevents the evaporation of perspiration, the body's second chief means of cooling itself.
   C. Vigorous physical activity
      Increases core temperature
   D. Water loss (dehydration)
      1. This occurs when high fluid losses are not quickly replaced.
      2. Less water is available for sweating, so cooling becomes more difficult.

3. If fluid loss continues, body eventually shuts down sweating mechanism.
4. Overheating rapidly occurs.

E. Salt loss (from perspiration)
1. Loss usually amounts to a few teaspoons daily.
2. Salt balance must be maintained for normal body functions.
3. Try to replace salt with normal food and drink intake. Salt tablets may place excessive salt in system.

III. Heat Injuries

A. Heat cramps—caused by excessive loss of water and salts.
1. To treat, discontinue activity.
2. Get into cooler area.
3. Gently stretch affected area.
4. Take salty fluids, such as 1 teaspoon of salt in an 8-ounce cup of water.
5. Postpone further activity for 24 hours.

B. Heat exhaustion—signals dangerous depletion of fluids and salts.
1. Marked by profuse sweating, dizziness, confusion, fatigue, excessive thirst, dilated pupils, and clammy skin.
2. For treatment, begin with same measures used for heat cramps.
3. Bathe victim in cool water.

C. Heatstroke—develops when perspiration mechanism breaks down.
1. Symptoms include hot, dry skin (usually red); absence of perspiration; rapid pulse; abnormal breathing; constricted pupils; faintness or unconsciousness; very high body temperature.
2. Begin lowering body temperature immediately.
a. Move victim to cool, shady spot.
b. Slightly elevate head and shoulders.
c. Remove victim's clothing and rub the body with water and ice or with alcohol.
d. Fanning will help the evaporation process.
e. If victim is conscious, give him cool water to drink.
f. Seek prompt medical attention, if possible.
3. Heatstroke can lead to permanent organ damage or death.

IV. Prevention of Heat Injuries
   A. Confine activity to cooler hours of day or night.
   B. Dress appropriately.
   C. Avoid exposure to direct sunlight.
   D. Reduce activity to a minimum.
   E. Rest frequently if activity is necessary.
   F. Replace fluids and salt. Water or drinks with low sugar content are best.
   G. Avoid salt tablets. Excessive salt intake hurts more than it helps.

V. Optional Student Activities
   A. Cloth wicking lab
      1. Materials needed: small beaker; strip of cotton, synthetic, and wool material 1" x 6", plastic ruler.
      2. Procedure: Place the ruler in 1 inch of water, and beside the ruler place a strip of cloth. Record every 15 seconds the height the water will go until there is no change. Do this with each piece of cloth. Graph the results.
      3. Questions:
         a. If you were going to hike in a hot climate, what material should your socks be?
         b. What kind of socks would you wear at 15,000 feet?
         c. What kind of clothing would you wear during the day if it is 85° F (30° C) and you are working hard?
         d. What kind of clothing would you wear in the wet tundra (without rain gear)?
   B. Effect of evaporation
      1. Materials needed: 2" x 2" pieces of cotton, wool, synthetic material
      2. Procedure: Wrap the end of your thermometer with a piece of cloth. Wet it with water. Record the temperature. Fan two minutes and record the temperature.

Material	Dry	Wet	After Fanning	Results
Cotton				
Wool				
Synthetic				

      3. Write your conclusions.

No. 7

Title: Fire Building

Method: Lecture, class activity

Time: 50 minutes

Purpose: For students to learn the importance of a fire in an environmental emergency and to practice building a fire.

Curricula: Physical Education, Science

Instructional Aids: Fire building materials

Facilities: Classroom, outdoor area

Outline:

I. Importance of Fire
   - A. Gives light and warmth
   - B. Can be used for cooking and drying clothes
   - C. Provides method of signaling
   - D. Becomes a friend—can boost morale

II. Needs and Safety Factors
   - A. Do not start a fire if it might get out of control.
   - B. If you determine it's safe to build a fire, begin to build one two to three hours before dark if possible. Collect two to three times as much wood as you think you'll need.
   - C. Build a fire only as large as necessary. Save fuel and energy.

III. How To Build a Fire
   - A. Select safe area away from overhangs, snow, limbs, or flammable materials.
   - B. Build so as not to disturb the area if possible, or have only minimum impact.
   - C. Clear 5- to 6-foot circle down to mineral soil. Leave no roots or duff underneath.
   - D. Gather wood. Collect twice as much as you need.
   - E. Organize materials into three piles:
     1. Tinder—used to ignite first flame
     2. Kindling—should burn from flame started by tinder
     3. Fuel—wood that will not burn from a single flame
   - F. Start small and build. Be careful not to snuff out the flame. Increase the size of the wood and fan the blaze.
   - G. If it's raining, improvise a cover.

IV. Types of Fires
   - A. Tipi fire—easiest to build and most versatile
   - B. Log cabin fire—used to produce a good bed of coals
   - C. Pit fire—used when wind is strong

Note to instructor: *Have examples of each to show students.*

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V. Firecraft
   A. When building a fire upon snow, set up a platform made of mud, green logs, or rocks.
   B. Avoid placing rocks found in or near water around a campfire. The moisture inside them may cause the rocks to explode.
   C. A reflecting wall (made of logs, for example) will direct heat and cut down on the wind effects.

VI. Putting Out Fire
   A. Pour water and/or dirt on the fire
   B. Do not consider fire out until entire area is cool to hand.

VII. Optional Student Activities
   A. Fire building exercise
      1. Materials needed: An outdoor area with adequate fire building materials and a place to build fires (you also can haul in firewood and use a parking lot or playground), 1 or 2 lb. coffee cans, water, matches
      2. Procedures
         a. Divide class into small groups of 2 to 4 per group.
         b. Give each group only *one* match and a coffee can half-filled with water.
         c. Have group collect firewood, build a fire and attempt to get their can of water to boil.
         d. The group whose water boils first survives. Any group not even getting their fire lit freezes to death.
      3. Evaluation:
         Ask students to describe their experiences.
         Did they improvise at all?
         What problems did they have?
         Did working under pressure make it harder?
         What if they were freezing?
   B. Starting a matchless fire
      1. Have students research how to build a fire without matches (see *Campground Cookery* module).
      2. Divide students into groups and have each group demonstrate a different method. How successful is each method? When would each be appropriate for an environmental emergency?

Fire Building Principles

1. *An inexperienced person should start early to prepare a fire.*
2. *The only way to become skillful in the art of fire making is to practice.*
3. *A woodsman is known by the first time it takes him to build his fires with whatever materials there may be at hand.*
4. *Dry innerbark is the best tinder material and stays dry most of the year.*
5. *It's important to know what materials are available in certain areas and how they work as a fire material.*
6. *Use flames for boiling, use coals for broiling and frying.*
7. *Split wood burns better than whole chunks.*
8. *Soft woods give light. Hardwoods give heat.*
9. *Use reflectors for warmth.*

by David Knotts

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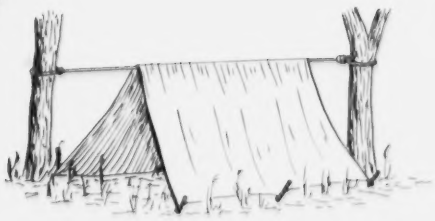
No. 8

Title:	Shelter Building: Poncho Pup Tent
Method:	Individual or group field activity
Time:	50 minutes
Purpose:	For students to learn how to construct basic environmental protection using limited materials.
Curricula:	Physical Education, History
Instructional Aids:	Poncho or similar material; light rope, such as clothesline or twine; light cord (shoestring or twine).
Facilities:	Wooded area preferred

Outline:

I. Choose an area where a rope can be secured between two points, waist high.
II. The distance between the two points should be equal to the length of the poncho, plus 2 feet on each end. (For example, if the poncho is 7 feet long, the distance between the two trees or posts should be at least 11 feet.
III. Tie the rope tightly between the two points.
IV. Drape the poncho over the center of the taut rope.
V. Using short pieces of light cord, stake the bottom of the sides of the poncho to the ground. Stretch the sides to a 30-degree angle from the line.
VI. Depending on the size of the poncho or material being used as the shelter covering, the student may need to raise or lower the ridge line or adjust the angle at which the fabric is staked.
VII. A properly constructed shelter will have firm sides that are touching the ground. No sagging fabric or large wrinkles should be permitted.

(For more shelter information, see "Tarp tricks" in the *Historic Crafts and Skills* module.)



Poncho pup tent made with rope and a tarp

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No. 9

Title:	Shelter Building: A-Frame
Method:	Individual or group field activity
Time:	50 minutes
Purpose:	To help students plan and construct improvised shelters, to create a comfortable and protected atmosphere within an emergency situation.
Curricula:	Physical Education, History
Instructional Aids:	The following are needed for each shelter: standard size poncho or other material; cord or light line; two poles 4½ feet long and one ridge pole, 2 feet taller than the shelter's occupant (use downed branches, 1½ to 2 inches in diameter, or substitute lumber).
Facilities:	Any area large enough to accommodate the number of shelters to be constructed

Procedure:

Note to instructor: This same shelter can be built with sticks.

I. For personal sizing, have each student cross the shorter, bipod poles at chest height at a 45-degree angle. Mark the intersection.

II. Lay the bipod poles parallel on the ground and lash them together at the marked point.

III. Stand the lashed bipod up at its 45-degree angle and place the ridge pole at the point of lashing. (See illustration.) This forms the A-frame structure. Secure all three poles at the intersection with additional lashing.

IV. Lay the poncho over the ridge pole for the main shelter covering. Pull the sides out and secure to the ground using heavy objects or stakes. Standing at the shelter entrance, grab both sides of the poncho, pull it forward, and secure it to the bipod poles.

V. Use more ties to make the structure taut and to remove wrinkles.

A-frame shelter

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No. 10

Title: Water Procurement: Plastic Bag Still

Method: Individual or group field activity

Time: 30 to 50 minutes

Purpose: To teach students the skills needed to procure water when obvious water sources are not available.

Curricula: Science, Physical Education

Instructional Aids: A clear plastic bag, 30- to 40-gallon size, for each student or team.

Facilities: Any area where shrubs or trees are available

Outline:

I. Introduction
   - A. Plastic bag still is one of many techniques used to procure water from other than a reservoir.
   - B. It is probably the quickest and easiest.
   - C. It requires no digging or cutting and no special equipment except a large, clear plastic bag.

II. How Plastic Bag Still Works

It is a result of the "*greenhouse effect.*" The plastic, enclosed environment becomes hotter than the surrounding, outside air. The moisture created by foliage inside the bag will condense against the cooler surface of the plastic and collect inside the bag.

III. Putting Together a Water Still
   - A. Choose a branch on a living tree, a bushy shrub, or other dense plant growth.
     1. Choose growth with lots of greenery, since the moisture in the foliage will be mainly responsible for the water you collect.
     2. The water you collect will carry the flavor of the foliage, so choose appropriately.
     3. *Do not* collect water from poisonous plant species. The poisonous qualities may be transferred to you through the water.
   - B. Completely enclose as large a section of the vegetation as possible with the plastic bag. Tie it off securely around the stem or branch.
   - C. Walk away, and let nature do the rest. With good greenery and sunlight, up to a quart of water can be collected per day. For more water, set up more than one bag.

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D. To remove water, carefully untie the bag and pour into a container at the point where the bag is tied to the branch. If it is easier to do this after removing the bag from the vegetation, go ahead. Be careful not to tear the bag and lose some of your collection.

IV. Experiments With Plastic Bag Stills
- A. Compare colored bags with clear bags to see which produces more water.
- B. Keep notes on weather conditions and their effect on water production.
- C. Compare the output from trees, shrubs, and plants to determine which give the best yield.
- D. Do research as a class to determine which vegetation gives the best-tasting water and which gives the worst. Rank the flavor of as many species as possible.

No. 11

Title: Food Procurement: Wild Edibles

Method: Lecture and field activity

Time: Will depend on field trip

Purpose: To teach students some of the wild plants that are edible and let them practice preparing wild edibles to eat.

Curricula: Home Economics, Science

Instructional Aids: Plants collected and equipment to prepare them. *Wild Edibles of Missouri* by Jan Phillips (available from the Missouri Department of Conservation), *A Field Guide to Wildflowers* by Roger Tory Peterson and Margaret McKenny

Facilities: Wooded area with appropriate plants

Outline:

I. Introduction
- A. There are no rules of thumb for differentiating between harmful and edible plants.
- B. Learn which plants are edible. Note their shape, size, color, and what environment they grow in.
- C. *There is no substitute for knowing your plants!*
- D. Eat small amounts until you know your digestive system is accustomed to the new diet.
- E. Remember one important rule: Never expend more energy pursuing a food source than the energy that source provides.

Editor's Note: *Material for this lesson plan was furnished by David Knotts, Program Coordinator, Piney Woods Conservation Center, Nacogdoches, Texas. David has written numerous articles on the subject, taught workshops, and prepared wild edibles on family camping trips.*

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Note to instructor: *If you do not know how to identify edible plants, take a forester, botanist, or county agricultural agent with you on the field trip. Let them point out the appropriate plants. Be sure that you know which plants are protected by state and federal laws. These should never be used except in a real survival situation.*

II. Edible Portions of Plants
   A. Roots
      May be roasted or boiled and eaten like baked or mashed potatoes, or dried and ground into flour.
   B. Seeds
      1. To remove chaff, beat seeds with stick then toss into the air over a blanket or tray. Wind will blow most of the chaff away.
      2. Seeds are tastier if ground into flour. Place handful of seeds on a large, smooth stone and grind with a smaller stone.
      3. To make a paste, soak seeds until they are soft, then grind them.
      4. Seeds can also be dried and stored.
   C. Bark and leaves
      1. Select only young and tender portions and cook as soon as possible.
      2. Boil like any domestic greens.
   D. Nuts
      Eat raw, roasted, or mixed with bread and soups.

III. Ways To Eat Plants
   A. Salad—may be eaten alone or mixed with a variety of other plants.
   B. Pot Herb—must be cooked in water (like spinach). Some require changing the water once or twice during the cooking.
   C. Vegetables—prepared similar to domestic beans or corn by boiling, steaming, or baking.
   D. Potatoes—tubers and roots that may be boiled, baked, fried, or dried.
   E. Teas—dry leaves steeped in hot water used as a substitute for cultivated teas.
   F. Flour—made from tubers, roots, nuts, or seeds of many plants by drying and grinding.
   G. Fruit—used raw, cooked, or dried.
   H. Nuts/Seeds—may be eaten raw, ground into flour, mixed in salad or soups, or used as a source of cooking oil.
   I. Sugar/Syrup—drawn from tree sap. Collected by cutting a hole 1½ inches deep and inserting hollow twig to allow sap to drip into container.

IV. Preparing Meals
   Preparing tasty meals is often a matter of trial and error. In many cases, standard recipes may be followed simply by substituting the wild plant for its domestic counterpart.

V. Class Activity
   Take a field trip to hunt and pick wild edibles for preparing a meal. Plan a menu and prepare the food. Critique the food after everyone has eaten. What plants were tastier than others? Which ones were difficult to obtain? How much energy was required to collect various plants?

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No. 12

Title:	Food Procurement: Traps and Snares (These are illegal in Missouri)
Method:	Individual or group field activity
Time:	Three hours total. Lesson may be divided into smaller units.
Purpose:	To teach students a variety of primitive techniques that can be used to capture wildlife for food during an emergency situation.
Curricula:	Physical Education, Science, History, Social Studies
Instructional Aids:	Small roll of light, malleable craft wire; pocketknife; twine or parachute cord
Facilities:	A wooded area is preferred.

Outline:

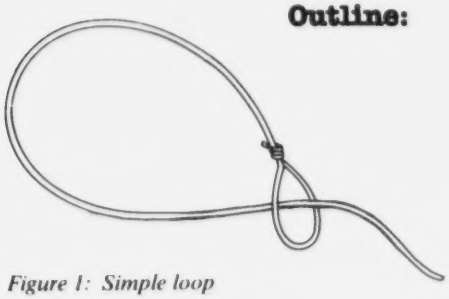

Figure 1: Simple loop

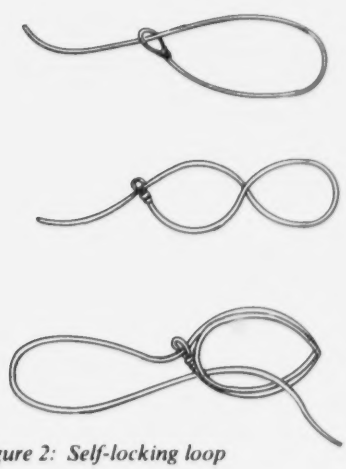

Figure 2: Self-locking loop

I. Simple Loop and Self-Locking Loop (30 minutes)
   A. Simple loop
      1. Form a 1/4-inch fixed loop in one end of a piece of snare wire. Twist the loop three times to be certain it is secure. (See Figure 1.)
      2. Pass the other end of the wire through this fixed loop.
      3. The size of the loop that you form when you pass the running end of the wire through the fixed loop depends upon the animal you'll be attempting to snare. Make the noose slightly larger than the animal's head, but smaller than its shoulders.
      4. Secure the end of the wire to a rock, stake, or other fixed object. Then place your pre-sized loop over a ground burrow entrance, such as a gopher or chipmunk hole. The simple loop snare is set.
   B. Self-locking loop
      1. Form a fixed loop (just big enough to work with) in one end of a piece of snare wire.
      2. While holding the top of the loop with two fingers, grab the bottom of the loop.
      3. Twist the top of the loop one-half turn until a figure eight is formed.
      4. Fold the top half of the figure eight down over the bottom half. (See Figure 2.)
      5. Pass the running end of the wire through this new double loop. Set the size of the noose. Tie the other end of the wire to a fixed object.

         This creates a self-locking loop. When an animal goes into the loop and pulls it tight, the fixed double loop (the eyelet) will fold against itself and "lock in" the animal.

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II. The Squirrel Pole (30 minutes)

A. Place a pole about 3 inches in diameter in the fork of a tree. One end of the pole should rest in the tree; the other end should rest on the ground at no more than a 45-degree angle from the tree. The angle and the distance from the fork of the tree to the ground will determine the length of the pole. (You can also rest a pole between the main forks of two trees that are close together, so that the pole becomes the path between the two trees.)

B. Set a series of simple loop snares at least 18 inches apart along the top side of the pole. Make the loops large enough for a squirrel's head to pass through, but not his shoulders.

C. Mold the wire so that the loop hovers above the pole. Set the loop at the same height as a squirrel carries its head.

D. Leave about 12 extra inches of wire, then tie the running end of each loop onto the pole. This extra length of wire will allow snared squirrels to fall and hang below the pole. Then they will not interfere with other squirrels using the same pole. (See Figure 3.)

E. Use "guide sticks" or natural twig growth to help the squirrel decide whether to go through your loops. Use corn and nuts to bait the squirrel into using the pole.

Figure 3: Squirrel pole

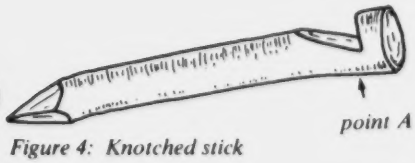

Figure 4: Knotched stick

III. Two-Pin Toggle With Dead Drop (one hour)

A. A two-pin toggle is made with two notched and fitted sticks. As with all snare devices, the sticks should be made from dead, dry hardwood. Sticks that are 1 inch in diameter work well.

B. The length of the first stick will be determined by the condition of the ground. If the ground is soft, the stick will need to be longer than usual, or the weight of the dead drop (the counterweight) will pull it out of the ground. Under normal conditions, a stick pounded 6 inches into the ground will be sufficient.

C. Notch the sticks as shown in Figure 4. Be sure to leave at least one-half inch thickness of wood at Point A, or the end might break off from the pressure that will be applied when the snare is set.

D. Figure 5 represents the completed two-pin toggle.

E. Stick No. 1 is secured in the ground.

F. Stick No. 2 has the simple or self-locking loop attached. (Experienced trappers will observe the trail and its markings to determine which animals are most likely to pass and to decide how big to make the loop.) Stick No. 2 also has the dead drop (a counterweight, usually at least twice the weight of the animal) attached.

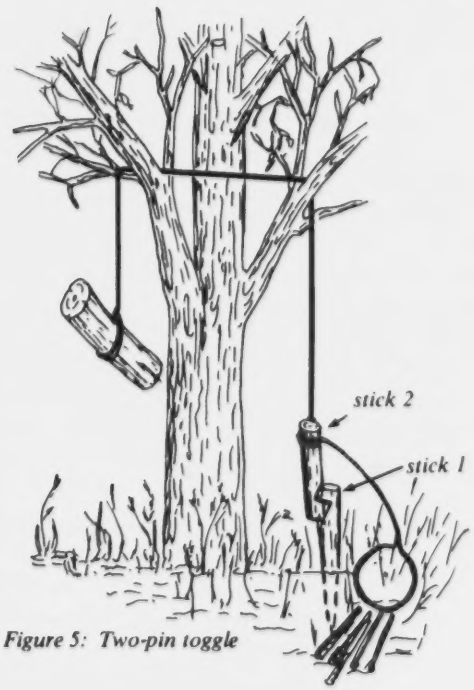

Figure 5: Two-pin toggle

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G. The line from Stick No. 2 to the dead drop should be draped over a limb and should be long enough to leave the animal hanging in the air when the drop hits the ground. Design the snare so that the animal will hang away from any branches and several feet off the ground.

H. The snare loop should be artfully placed in a game trail, camouflaged, and perhaps held in position by small sticks. Set up guide sticks or "stepping sticks" to force the animal into the loop.

I. When the animal comes down the trail and becomes caught in the snare, it will pull against the loop and pull the two-pin toggle apart, allowing the dead drop to do its work.

Figure 6: Figure H with twitch-up

IV. Figure H With Twitch-Up (one hour)

A. Notch two sticks, just as you did for the two-pin toggle. Both sticks should be at least 12 inches long since both will be pounded into the ground on each side of a trail.

B. A cross-piece or trigger is also needed. This piece should be cut and each end shaved down to fit into the notches of the trail-side sticks. (See Figure 6.) Note: If you shave opposite sides of the trigger and have the support sticks facing opposite directions, the snare will work regardless of which way an animal enters the loop.

C. Notch the center of your trigger, and tie your snare loop to that point.

D. A twitch-up is another form of activating mechanism, similar to the dead drop. A tree branch or a sapling is pulled down, and a line is tied from the limb to the trigger crosspiece. (When selecting a limb or branch, be sure it is strong enough to lift the animal you are trying to snare.)

E. When the snare is activated, the limb or branch snaps back to its original position, and the animal is snared and left hanging in the air.

V. Refinements for Snare Assemblies

A. Make the snare look as natural as possible.

B. Set up obstacles beside the trail so that the animal has no choice but to attempt to move through the snare.

C. Camouflage the snare wire or line with dead grass, leaves, and carefully placed guide sticks.

D. Adjust your snare so that it will be activated by the lightest nudge of the animal. You can do this by moving the trigger piece of the assembly away from the support sticks so that the pieces barely make contact.

E. Always test your set before leaving it.

F. The more sets you make, the better your chances.

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VI. Pole Snare (30 minutes)

A. The pole snare is a simple, but effective device for catching the animals that are usually just out of reach—rough fish, turtles, frogs, and other water animals.

B. Begin with a long, straight pole—light, sturdy, about 1 inch in diameter and 6 feet long.

C. Take at least 8 or 9 feet of snare wire to make a simple loop at one end. With two smaller pieces of wire, tie the longer wire onto the pole. Tie it firmly, but not extremely tight, about 1 foot from the handle end of the pole. Tie the pole again about 2 inches from the end where the loop is. These ties will keep the snare line on the pole, just as a fishing rod holds fishing line. (See Figure 7.)

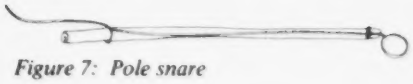

Figure 7: Pole snare

D. Control the size of the loop by pulling on the end of this long wire. The smaller ties prevent the loop from being pulled all the way up the pole and allow it to be pulled tight on the animal at the end of the pole.

No. 13

Title: Food Preparation Techniques: Planking and Mud Baking Fish

Method: Individual or group field activity

Time: One to two hours depending on method used

Purpose: To demonstrate ways food can be prepared without the use of conventional cooking utensils.

Curricula: Home Economics, Science, History

Instructional Aids: Minimum of two wooden skewers, 12 to 15 inches long; two wooden pegs; fish (carp or sucker preferred); bark slab or similar wood (a 1-foot square of green wood is preferred).

Facilities: Outdoor setting with open fire

Outline:

I. Planking Fish

A. Prepare a fire site and build a fire capable of maintaining a moderate flame throughout the cooking process.

B. Use fish of an oily nature, such as carp or sucker, to best demonstrate the merits of the planking technique.

C. Clean the fish. Removing the head and entrails is sufficient.

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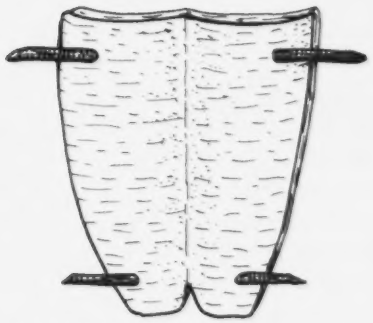
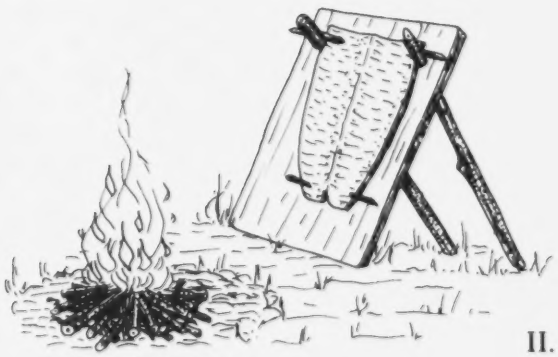


Fish skewered



Cooking planked fish

D. Cut along the backbone of the fish from top to bottom. Leave the skin intact.

E. You should now be able to open the fish like a book. The fish may have the tendency to close back up now or during cooking, so it should be skewered top and bottom.

F. Two green branches about 3/8 inch in diameter will work as skewers. With the backbone running up and down, push one end of the wooden skewer through at the top left corner of the fish, 1 inch from the edge and 1 inch down. Then run the skewer along the back or skin side of the fish and push it through at the same location on the right side. This support will hold the split fish open during cooking.

G. Repeat this procedure to skewer the bottom of the fish. (See illustration.)

H. Position two wooden pegs, or some modification, to the top of your plank or slab. Hang the skewered fish to these pegs. By hanging the fish, instead of literally pegging them to the board, they can be rotated during cooking.

I. Set the plank 1 or 2 feet from the fire (fire size will determine the distance), propped up at about a 75-degree angle. As the fish cook, the oils will drain off.

J. When cooking is done, the fish will flake nicely. Remove the prop sticks from the plank, and use it as your plate.

II. Mud Baking Fish

A. Any fish will work, but this cooking technique is especially suited for small fish, such as crappie and sunfish.

B. Prepare a fire site and develop a good bed of coals. This technique uses the coals, not flame, for cooking.

C. Remove only the entrails from the fish. The head, fins, scales, and everything else can remain.

D. To enhance the flavor of the fish, stuff the eviscerated cavity with carefully selected leaves. If you stuff the cavity with pine needles, the fish will taste like a pine tree. Leaves that work well are wild grape and any plants from the mint family. Other edibles, such as dandelion, lamb's quarter, or plantain also work, but they give off little flavor.

E. Use a few large leaves to completely wrap the fish. These leaves should be from an edible plant. Wild grape or burdock leaves make good wrappers. The leaves protect the fish flesh from the mud packing.

F. Next, pack the whole fish in mud. Clay soil makes the best mud for this, but any soil mixed with water that creates a sticky consistency will work.

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Pack the fish with a layer of mud ¾ to 1½ inches thick. This layer forms a baking oven.

G. Cover the mud-packed fish with coals. Cook for 15 to 20 minutes.

H. When cooking time seems adequate, remove the fish from the coals. Allow the mud to cool slightly, then carefully break open the mud pack. The contents will be hot and steamed.

I. Remove all leaves, open the fish, and enjoy a tasty, baked fish meal.

J. As an alternative, do not use any leaf wrap around the fish and pack the mud directly against the skin. When the mud is removed from this version, the skin will stick to the mud and leave only flaky, cooked flesh for the diner.

No. 14

Title: Using a Signal Mirror

Method: Individual, partner, or group field activity

Time: 50 minutes

Purpose: To enable the students to gain command of a commerical or improvised signal mirror.

Curricula: Physical Education, Science

Instructional Aids: Commercial signal mirrors are preferred, but optional. Belt buckles, tin can lids (shortening can lids work well), and any other materials that have a reflective quality.

Facilities: Outdoors on a sunny day.

Outline:

I. Uses of Signal Mirrors
   A. Effective to signal searching aircraft.
   B. Can only be used during daylight and fairly clear sky conditions. An overcast day will not provide enough reflecting light for a good signal.

II. Commercial Signal Mirrors
   A. Vary from durable glass mirror to shiny metal plate.
   B. Usually available at reasonable cost from military surplus stores.

III. Using a Commercial Signal Mirror
   A. Attempt to send reflected light from the sun to the horizon. Angle the mirror so that you can reflect light rays for a full half-circle. It is possible, but difficult, to use a signal mirror in a full circle.

Note to instructor: *Be careful when practicing or pilot may assume an actual emergency.*

B. When you hear the sound of an approaching aircraft, signal toward the sound. Under good conditions, an aircraft can spot reflected light from as far away as 18 to 20 miles. Even under hazy conditions, light can be seen up to 10 or 11 miles.
C. To help the pilot find your signal, gently wiggle the mirror so that the reflections will cover a greater area.

IV. Improvised Signal Mirrors
A. Usually not as efficient as commercial mirrors because they lack sighting devices.
B. Any item with a flat surface and tendency to reflect sunlight can be used.
1. Tin can covers
2. Belt buckles
3. Watches, metal watch bands
4. Aluminum foil
5. White, glossy credit cards
6. Knife blade
7. Spinner blade from fishing lure
8. Try some ideas of your own.

V. Signaling Practice
A. Divide up into partners and spread apart about 20 yards for first attempts.
B. Stand so one partner only is facing the sun. This person should now practice "hitting" the other person with light rays. To aim, hold the mirror in front of you, about nose level, with one hand. Extend your other hand in front of the mirror at arm's length, directly in line with your partner or object you're trying to hit. Reflected light is easily seen on the extended hand. From there, you should be close in line with your target.
C. Change positions so the other partner is facing the sun, and let him practice aiming with the mirror.
D. Move so both are at a 90-degree angle to the sun and repeat the signaling efforts. This position will require signalers to hold the mirrors differently.
E. Spread out to 50 yards, then 100 yards, and repeat the signaling efforts.

Signaling with a mirror

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No. 15

Title: Direction Finding: Primitive Indicators of Direction

Method: Individual or group field activity

Time: 50 minutes

Purpose: To enable the students to determine general direction, based on natural indicators.

Curricula: Science

Instructional Aids: Pad and pencil for notes: compass for confirmation of findings (optional).

Facilities: Wooded area preferred. Boulevards, vacant lots, and school grounds with tree growth will also work.

Outline:

I. Determining Direction from Nature
   A. Make as many observations as possible before making a final decision about a specific direction.
   B. Accept nature as a general indicator. Sometimes, when observing trees or plant growth for signs, no direction will be favored. For example, moss is said to grow on the north side of trees, but it can also be found growing on the east, west, and south side of trees. The truth is that moss grows best on the shaded side of a tree, which is generally the northern side.

II. Some Natural Indicators
   A. Insect burrows, frequently seen as blotches on trees, are found on the warm side of the tree, generally the south side.
   B. Growth rings on cut stumps are usually widest on the warm side of the tree, generally the south side.
   C. Fallen leaves beneath a tree will be deposited according to the prevailing winds. In Missouri, these winds are usually from the west, so the leaves, generally, will be found on the east side of the tree. Landforms can upset this guideline, however.
   D. The color of tree bark on the same tree will frequently reveal north and south. If the bark is darker, has a smoother texture, and a more solid color on one side, this is usually due to punishment from wind, rain, and snow and generally indicates a northern exposure. The tree's south side often has a lighter, rougher bark, as a result of more exposure to the sun.

Note to instructor: *Remind your students that these are only indicators and cannot be counted on as definite signs.*

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E. Tree branches are generally thicker and larger on the south side of a tree. This is one of the easiest primitive indicators to observe and one of the most reliable.

F. Spiders generally weave their webs on the south side of a tree or shrub. If you discover an anthill, you may see that ants pefer a southern or southeastern entrance to their home.

No. 16

Title: Direction Finding: Star Movement

Method: Individual field activity

Time: 15 to 30 minutes (at night)

Purpose: To enable students to determine general direction by observing selected star movements.

Curricula: Science

Instructional Aids: Two sticks (natural materials will work fine)—one about 12 inches long, the other about 18 inches long. The sticks should be straight and firm.

Facilities: Outdoor open area where stars are easily viewed.

Sighting on a star

Outline:

I. In an open area have individuals find comfortable prone positions where each can observe, unobstructed, the movement of a single star.

II. Set up the "sighting" sticks. Place the shorter of the two sticks firmly into the ground 1 to 3 feet in front of the observer's face.

III. Push the longer stick into the ground 1 foot beyond this stick. While in the prone position, use them as you would sights on a rifle. Line up the top of the short stick with the top of the taller stick. This line-up will give a line-of-sight into the sky. (See illustration.)

IV. If by chance your line-of-sight puts you right on a star, use that star for your observations. If the line-of-sight points to an empty area, adjust the two sticks and your prone position until you do line up a star. The two sticks simply ensure that your observation point remains fixed and that you are detecting the star's movement and not your own.

V. Stars will travel from east to west. Observing an individual star can reveal the general direction any person is facing. You can make directional judgments after only three or four minutes with the following techniques:

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A. If the star you're observing appears to be moving straight up above your line-of-sight, you are facing east.
B. If the star you have sighted disappears behind your lined-up sticks, you are facing west.
C. If the chosen star appears to be moving in an arc to the left, then you are facing north.
D. If the star arcs to the right of your fixed line-of-sight, you are facing south.
E. Any combination of up or down movement with a right or left movement will give an in-between position, such as northwest or southwest.

VI. Check your accuracy by comparing your readings to those from a compass or use the North Star as a reference. Be careful not to sight in on a satellite. They don't necessarily travel from east to west.

No. 17

Title: Improvising

Method: Lecture, discussion, field activities

Time: Will depend on activities chosen

Purpose: To discuss how the necessities of life can be met in the wild with improvisational skills.

Curricula: Physical Education, Science, Psychology, Social Studies

Instructional Aids: For optional student activities—fire-building materials, water and shovel to control fire.

Facilities: Classroom for lecture. For activities, any open area where students will have freedom to rearrange natural materials and where fire is permitted.

Outline:

I. Improvising—Art of Problem-Solving With Materials at Hand
   A. Determine needs, and ask:
      1. What will satisfy that need?
      2. What does it do? How?
      3. What is it made of?
      4. Could it be made of other materials?
      5. How was it constructed?
      6. How can it be made from materials at hand?
   B. Catalog the materials that are available.
      1. Look for man-made objects.
      2. Look for natural materials.
      3. Search area. Don't overlook anything.

C. Adapt what you have to your needs.
   1. Brainstorm until you have a solution.
   2. Experiment. Modify your designs.
D. Expect failures and false starts.
   Maintain a positive mental attitude.
E. Optional student activity
   Have students describe how they would improvise
   1. A cutting tool
   2. A shelter
   3. Clothing
   4. Signals

II. Guidelines for Establishing Shelter
   A. Choose a location near water, firewood, natural windbreaks and protected areas, signaling area, and stalled transportation (car, boat, or plane).
   B. Choose a location away from avalanche areas, falling rock, insects, swamps, dead trees, water runoff, dry stream beds, ridges, and colder areas (unless to combat heat).
   C. Before constructing shelter, weigh the amount of energy to be used against the amount of energy that will be saved with the shelter.

III. Improvising Snow Shelters
   A. Snow trench (for individuals)
   B. Snow cave (for two or more)
   C. Tree pit shelter

IV. Improvising Wooded-Area Shelters
   A. Blow-downs
   B. Caves
   C. Hollow logs
   D. Outcrops
   E. 'A' frame
   F. Lean-to
   G. Willow hut

V. Other Shelters
   A. Wool clothing
   B. Plastic bags or plastic sheet from emergency kit
   C. Blankets or sheets
   D. Car, boat, or plane

VI. Improvising Signals
   A. Basic rules
      1. Create contrast within the environment.
      2. Choose clear area so that signal may be seen in all directions.
   B. Signal fires
      1. White smoke by day will contrast with green vegetation.
      2. Black smoke will show up against snow.
      3. The hotter the fire, the higher the smoke will rise.
      4. Three fires in equilateral triangle make best signal, but not necessarily if too much energy is required.
      5. Place fires away from trees, which dissipate smoke.

6. Blaze works as night signal, but most searches stop at dark.
7. Have materials ready for fast signaling in case plane or search party is heard.
8. Don't travel to ideal signaling area unless no proper signals can be made from local area.

C. Ground-to-air signals
1. Make letters as large as possible, 60 feet or more.
2. "SOS" is best message, but requires lots of energy.
3. Follow standardized code for ground-to-air signals, or just use "X," a good letter for contrast. There are no straight lines in nature.
4. In meadow, stamp grass flat.
5. In dirt or snow, dig and make shadows.
6. Form letters by laying boughs across snow.
7. In the desert, newspapers work if available.

D. Audible signals
1. Three gunshots or three whistles in a row. Pause, then repeat.
2. Any noise.

E. Other visual signals
1. Mirror
a. Rearview mirror
b. Compact mirror
c. Shiny, polished metal
2. Colorful flags
3. Trail markers
4. Arrows, showing direction of travel

VIII. Improvising Travel Not Recommended
A. Ninety-nine percent of survival situations do not require travel.
B. Establish shelter, fire, and signals and stay put to conserve energy.

IX. Optional Class Activities
A. Have students develop a signal using only natural materials that disturb the natural appearance of the area. Remember that searchers may be on the ground or in the air. Search planes normally work from an altitude of about 800 feet.
B. Break into two groups. One group should find a good area and build a "series of three" signal. Assign the other group to build an "SOS." Compare the amount of time each took and compare how each contrasts with the area.
C. Assign a group of students to build a smoke fire. After fire is started, pretend you hear an aircraft. See how long it takes to get a good flame, then a heavy smoke cloud.
D. The best evaluation of group signal-making would be to have an area pilot fly over the signals and critique them.

No. 18

Title: Improvised Clothing: Rabbit-Hide Mittens

Method: Individual or group field activity

Time: 50 minutes

Purpose: To help students discover how clothing needs can be met using available resources and acquired skills.

Curricula: Science, Home Economics, History

Instructional Aids: 1 rabbit for each 5 or 6 students, skinning knives, plastic bags for rabbit carcasses.

Facilities: Outdoor setting

Outline:

I. Check with feed stores or the classified ads in your local newspaper to find a source of rabbits for this activity. The County Extension Service or local 4-H clubs may also be helpful. Large rabbits usually cost only $2 to $3. Have the rabbits killed.

II. Hang the dead rabbit upside-down by tying a separate line to each hind leg. Tie the opposite ends of these lines to an overhead limb or branch. Tie the lines so that the animal's hind legs are stretched apart and so that the rabbit hangs about neck-high to most class members.

III. Allot only one sharp knife per group to reduce the chance of accidental cuts.

IV. To begin what is known as "case" or "glove skinning," cut completely around the top of each of the four feet (not the top of the leg). This eliminates any skin connection between the feet and the rest of the body. These cuts will allow a tear-free removal of the skin as you proceed.

V. Next, starting from the inside of either hind leg at the circular cut you just made, cut down the inside of the leg, up to and around the anal orifice, and up the inside of the other leg to the circular cut on that leg.

VI. You shouldn't have to cut any more until you reach the animal's head. Work your fingers under the skin and carefully start to pull the skin off, much as you might peel a sock off your foot, turning it inside out. Work gently, since rabbit skins tear easily. When you reach the front legs, pull the skin inside-out off the legs.

VII. Keep pulling as far past the base of the ears as possible. Here, you will see two obvious bumps (about the size of quarters) where the ears are attached to the skull. Make a cut across the ears, not in line with them, that goes all the way through the cartilage to the skull.

VIII. Next, pull away the skin from the rabbit's eyes. Make the same kind of cut that you made with the ears. There will be slight bumps where the eyes are, or you may estimate their location. Be careful not to cut the skin; this will leave larger holes where the eye slits are located.

IX. Continue pulling the skin down to the nose of the rabbit. Pull firmly as far as you can, then make final cuts at the nose and mouth to remove the skin from the carcass.

X. With the hide turned inside-out, you can slide your hand into a very soft and warm, improvised mitten.

XI. Because a rabbit's skin is very thin, tanning is not necessary for this use. Just be sure all flesh pieces are removed, and allow the skin to dry naturally. Also, keep flexing the skins so that the mittens will be flexible.

XII. Try comparing the insulation value of rabbit-hide mittens to commercial mittens. Check the inside temperature of each with a thermometer. Make the tests under various conditions—in the refrigerator, in the snow.

XIII. After the rabbit has been skinned, eviscerate the carcass and refrigerate or freeze it for future use.

No. 19

Title: Improvised Equipment: Poncho Wash Basin, Poncho Bathtub

Method: Group field activity

Time: 50 minutes

Purpose: To allow students to discover that they can meet most personal equipment needs by using common sense and available resources.

Curricula: Science, Physical Education, Psychology, Home Economics

Instructional Aids: At least one waterproof poncho per group of four students; four pieces of medium-strength line, such as twine, 550 parachute cord, or clothesline; one saw per group (optional).

Facilities: Any outside area will suffice, but a meadow or park-like setting would work best. A supply of downed limbs is needed to provide poles of 1 to 2 inches in diameter.

Outline:

I. Introduction

A. Even in stressful emergency situations, it's important for persons to feel good about themselves.

B. Taking care of personal needs helps victims maintain a positive mental attitude. Washing clothes and taking baths may not be priorities, but they do boost a person's emotional, physical, and hygienic well-being.

Procedure:

II. Making a Poncho Wash Basin

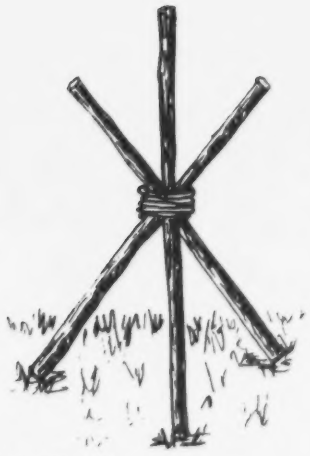
A. Take a standard waterproof poncho with the head drawstring pulled tight and tied. Fold it in half.

You can also use a sheet of durable plastic about 3 feet square. (This should be one of the elements of your emergency kit.) Make sure the plastic is leak-free.

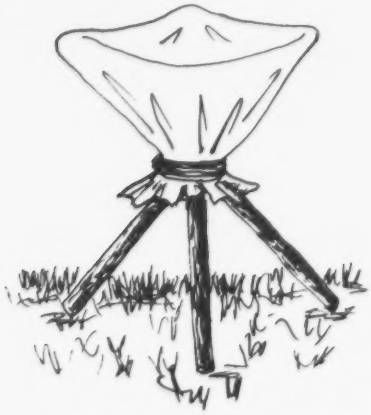
B. To make the tripod that will hold your basin, gather three poles about 5 feet long and 1 to 2 inches in diameter. Spread out the legs of the poles so that a firm tripod is formed. Adjust the poles so they cross each other about waist high, then lash all three poles together.

C. Next, lay the poncho or plastic sheet inside the tripod formed above the lashing point. Drape the excess material over and around the inverted tripod legs. Using your pieces of line, tie that material onto the legs. These ties will hold the basin walls up when you put water in the basin. (See illustration.)

D. Add water, and the basin is complete. It can be used for cleaning edible plants, washing dishes, or for washing hands and face.



Poncho wash basin



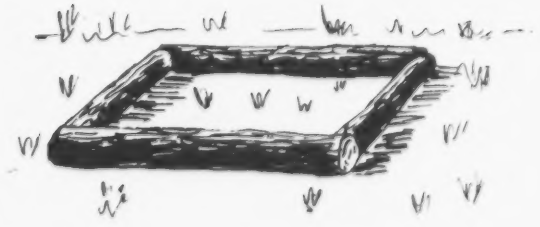
III. Making a Poncho Bathtub

A. A poncho that is 5 feet by 7 feet can be used to form the sides of a bathtub that will be 3½ feet wide and 5½ feet long.

B. The sides of the tub will be constructed from logs, so the depth of the tub will be determined by their size. Don't try to build a tub as deep as the one at home.

C. Choose four logs—two of them about 3½ feet long for the ends and two that are 5½ feet long for the sides. Modify these measurements to suit personal needs and body size. Lay the four logs in a rectangle. This is the skeleton of the tub.

D. Lay the poncho over the top of the logs. Be sure to tie the hood closed so that water does not leak out. Fit the poncho against the inside of the logs, then over all four and down to the ground on the outside of the logs. If you have excess material at this point, use larger logs and make the tub deeper. If you are short on material to fold over, use smaller logs or move the existing ones closer together.



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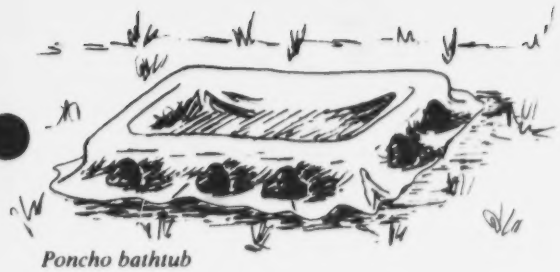

Poncho bathtub

E. You should have an 8- to 10-inch wide piece of poncho that lays flat on the ground outside of the logs. On top of this fabric, lay stones, other logs, or dirt to help hold the poncho in place. (See illustration.)

F. Add water, and you have a tub with many uses. It can also be a water reservoir or a holding pen for fish you've caught. You can heat the water by adding hot stones.

No. 20

Title: Natural Environmental Emergencies: Cold, Tornado, Lightning

Method: Individual or group pre-field activity

Time: One to two class periods

Purpose: To enable students to apply basic principles of safety when confronted with real natural emergencies.

Curricula: Physical Education, Health, Science

Instructional Aids: A selection of extra clothes for each student to demonstrate cold prevention techniques.

Facilities: Classroom or outdoor setting

Outline:

I. How to Prepare for Cold Temperatures

Use the acronym C-O-L-D to help remember how to combat the cold.

C = Clean clothes.

O = Overheating avoidance. Regulate activity and open and close clothing as needed to avoid sweating.

L = Layered clothing to create dead air space, insulating the body.

D = Dry clothing.

II. Preparing for a Tornado

A. Be on the lookout during periods of dark skies and high winds.

B. If a tornado is spotted, run as fast as you can in a direction 90 degrees to that of the oncoming twister. Never try to outrun a tornado.

C. Before the tornado hits, choose the lowest spot around you—a ditch or hollow. Lie down flat on your stomach and protect your head. This is the safest outdoor position available. Flying debris will, for the most part, go above your level.

Note to instructor: *Consult the* Basic Principles *module for more information on dressing for cold weather.*

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III. Safety from Lightning
   A. Since lightning usually strikes taller objects, get as far away as possible from tall objects.
   B. Try not to be any closer to a mature tree than twice the distance that the tree is tall. This keeps you away from the root system, which may conduct an electrical charge. In other words, if a tree is 90 feet tall, you should be no closer to it than 180 feet.
   C. Assume a huddled position so that only the soles of your feet touch the ground. Get as low as possible. Crouch down, lean over on your knees, put your arms around the front of your legs and balance there. Now you have a low profile and little ground contact. Wait until the lightning moves out of the area before you get up.

IV. Optional Student Activities
   A. Have students explain or demonstrate how to personally accomplish what the letters C-O-L-D stand for.
   B. Assign students to research cold prevention and provide an in-depth explanation of the following:
      1. Why clean clothes are warmer than dirty clothes.
      2. At least two ways to avoid overheating, based on two key words—"ventilation" and "hat."
      3. How dead air space insulates. What are some ways to develop dead air space? Why is goose down a good insulator?
      4. Why is wet clothing a poor insulator?
      5. Why is this saying true—"If your feet are cold, put your hat on."?
   C. Have students check these principles under real conditions. Take temperature readings between layers of clothing. Try readings again with different types of clothing.
   D. Have students seek immediate shelter from a simulated tornado situation. Have the students critique each other's site selections.
   E. Have students practice the safety position for avoiding lightning. Give them surprise lightning drills.
   F. Discuss other danger situations, such as those that involve lightning and water, or lightning and metal objects.
   G. Repeat surprise drills for tornado or lightning emergencies until the students' reactions are instinctive.

No. 21

Title: Emergency Kits

Method: Individual pre-field application activity

Time: 50 minutes

Purpose: To enable the student to assemble a compact, personal emergency kit that will fulfill the basic needs in an environmental emergency.

Curricula: Physical Education, Science, Health

Instructional Aids: The film "Ten Essentials," available from the Missouri Department of Conservation by contacting your Outdoor Skills Education Specialist. Kit items listed should be gathered by the students individually, brought to the class session, then checked by the instructor. Appendix 3 and 4.

Facilities: Classroom or other suitable meeting place

Outline:

I. Introduction—Class Activity

Prior to studying this lesson, ask students to prepare a small personal emergency kit. Either provide them with a 35mm film canister or other small container or tell them their kit cannot be larger than a certain size. Begin unit by asking students to show their kits and explain why they picked what they did.

Note to instructor: Emergency kits have purposely been put last because in most emergency situations, the victim does not have such a kit with him. Stress with your students that if an emergency kit is going to work it ***must*** *be taken on all outdoor trips. They should carry their emergency kit on an outdoor excursion just as their billfold or purse when they go shopping.*

II. Basics of an Emergency Kit
- A. Should assist in providing comfort and meeting emergency needs.
- B. Should be designed for easy transport, packed in container that is small, flat, waterproof, and sturdy.
- C. Contents should be determined by the following:
  1. Room in the container
  2. Personal requirements or desires
  3. Regional or seasonal expectations

Note to instructor: Reproduce and hand out Appendix 3 and 4 to students. Discuss information on each sheet, then encourage students to include this information in their emergency kits and their vehicles.

III. Possible Containers
- A. Flat—soap dish, small baking pan, for example
- B. Round—soup can, No 303 can, coffee can, tobacco can (Round containers can also serve as a drinking cup.)
- C. Others—plastic bag, nylon bag with drawstring

IV. Possible Contents
- A. Health and first aid
  1. Aspirin
  2. Antibiotic
  3. Antacid
  4. Adhesive bandages, tape
  5. Dressings
  6. Eye wash

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7. Soap
8. Salt tablets
9. Water purification tablets
10. Iodine
11. Others

B. General use
1. Pocketknife
2. Compass
3. Metal match, other matches, or tinder (small plastic bottle filled with coarse sawdust dampened with turpentine)
4. Candle
5. Plastic bags or plastic sheet
6. Magnifying glass
7. Needle and thread
8. Safety pins
9. Coil of wire
10. File
11. Ring saw
12. Whistle
13. Mirror
14. Razor blade
15. Fish hooks, flies, leader
16. Aluminum foil
17. Tweezers
18. Small flashlight

C. Emergency food
1. Bouillon cubes
2. Sugar cubes
3. Tea bags
4. Dried foods
5. Hard candy
6. Gum
7. Other items

D. Personal items

III. Don't leave home without it. Keep it on you!

IV. Optional Student Activities

A. Show "Ten Essentials," a film which illustrates 10 essential items to carry in case of an emergency. Have students take notes to answer the following questions:
1. What items should be carried for navigation? (Map, compass, flashlight, and sunglasses)
2. What should be carried for warmth? (Extra clothing, tent, tarp, and rope)
3. What items should be carried for an emergency camp? (Knife, matches, fire starter, and extra food)
4. What is the tenth essential? (First-aid kit)

B. Have students discuss ways they could remind themselves to always take their emergency kit.

C. Have students assemble the items in each suggested container. Have them make several attempts to make the kit as compact as possible.

Glossary

Adrenaline — A hormone excreted by a gland near the kidneys which affects metabolic functions.

Amnesia — Loss of memory which can result from shock or fatigue.

Anxiety — Worry about what may happen.

Carbon monoxide poisoning — Injury or death from excessive inhalation of this colorless, odorless, very toxic gas.

Cardiac fibrillation — Rapid, irregular contractions of heart muscle.

Convection — The transfer of heat by a circulatory motion of air that draws heat away from the body. The air warmed by body heat is replaced with colder air.

Core temperature — The body's internal degree of heat constant at 99° F (37° C) unless affected by illness or exposure.

Dehydration — An abnormal depletion of body fluids.

"Dog Days" — The period between July and September when the summer weather becomes hot and sultry.

Duff — The partly decayed organic matter on the forest floor.

Edema — An abnormal excess accumulation of fluid in body tissues.

Evaporation — The process of expelling moisture. It is the natural way the body cools itself. Moisture changes to a vapor or gas.

Electrolytes — A nonmetallic electric conductor in the body's fluids.

Fatigue — Weariness from labor, exertion, or nervous exhaustion.

Fear — A strong, unpleasant emotion caused by real or possible danger.

Forces of Nature — Uncontrollable outdoor conditions of rain, snow, wind, heat, and fire. Often referred to in weather terms.

Frostbite — A result of exposure to cold occurring in the body's extremities and peripheral areas when ice crystals form in the fluid and skin tissues.

Fuel — Wood that will not burn from a single flame when trying to start a fire.

Greenhouse effect — The condensation of water against the cooler surface of a container from hot air inside the container evaporating moisture in plant leaves.

Ground-to-air signals — A standardized code of symbols recreated 60 feet or taller on the ground to be easily recognizable from the air.

Heat cramps — The painful contraction of a muscle as a result of excessive loss of water and salts.

Heat exhaustion — Sweating, fatigue, dizziness, etc. as a result of a dangerous depletion of water and salts.

Heatstroke — Potentially fatal result of extreme depletion of water and salts when the perspiration mechanism breaks down.

Hemorrhage — Heavy, uncontrollable internal bleeding.

Humidity — The degree of moisture in the air.

Hyperthermia — Increasing of the body's core temperature, a condition related to the effects of heat.

Hypothermia — Lowering of the body's core temperature, a condition related to the effects of cold.

Kindling — Easily combustible material to start a fire with from tinder flames.

Panic — A sudden, overpowering fright resulting in irrational actions.

Parabolic reflector — A curved mirror used to reflect the sun's heat to ignite tinder.

Perspiration — The body's reaction to heat causing sweat glands to excrete a saline solution which evaporates, cooling the body.

Polaris — Also called the North Star, which is always within one degree from true north. It is used in direction finding.

Positive mental attitude — A state of mind that helps a person remain calm, clearly evaluate a situation, and make rational decisions in an environmental emergency.

Priorities for life — The bare essentials of air, shelter, water, and food without which death will occur.

Radiation — The process of emitting radiant energy (heat) in the form of waves or particles.

Shivering — The body's reaction to cold causing a person to tremble or shake in order to produce heat.

Signal fire — Burning materials that will produce smoke which contrasts with the surrounding environment to attract the attention of a rescue party.

Snow blindness — An inflammation of the eyes and sensitivity to light caused by excess exposure to ultraviolet rays reflected from snow or ice.

SOS	The international distress signal used to call for help.
Space blanket	An effective shelter from heat which reflects the sun by day and holds in heat at night.
Survival	The continuation of life through self-sufficiency in the wild.
Survival Emergency Kit	An inexpensive set of necessities always available for use in an unexpected environmental emergency.
S.T.O.P.	An acronym that stands for slow down, think, observe, and plan which helps a person maintain mental control.
Tinder	A highly flammable material used to catch an initial spark to start a fire.
Topography	The physical and natural features of the ground's surface.
Ursa Major	A constellation, often called the Big Dipper, that is used to find the North Star.
Will to live	An intangible, internal strength that helps a person survive in extreme situations.

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The National Safety Network offers workshops on "Safety Management for Outdoor Program Leaders." For more information, contact them at P.O. Box 186, Bellefontaine, Ohio 43311, 513/592-4686.

Appendix 1—Environmental Emergency Situation _____

The Situation

Your charter flight from Seattle to Banff, Alberta has just crash-landed in the North Cascades National Park area, near the Canada border (a very remote and rugged area). The 10-passenger plane, containing the bodies of the pilot and one passenger, has completely burned; only the air frame remains. The remaining eight passengers are not seriously injured. It is approximately 12 noon in mid-January. The pilot was unable to notify anyone of your position. You did notice that the plane's altimeter registered about 5,000 ft. The crash site is in a heavily wooded area just below timberline. You are dressed in medium-weight clothing and each of you has on a topcoat. You are in a raging, blinding snowstorm.

The Problem

Before the plane caught fire, your group managed to salvage the 15 items on the list. Your task is to rank order these items according to their importance to your survival. Write "1" next to the most important, "2" next to the second most important and so on, through "15."

Items to be ranked	Your Ranking	Solution	Difference in score
One metal coffeepot	_____	_____	_____
Two fifths of liquor	_____	_____	_____
Four wool blankets	_____	_____	_____
Jackknife	_____	_____	_____
Sectional air map of the area	_____	_____	_____
Flashlight, 4-battery size	_____	_____	_____
One pair of skis	_____	_____	_____
One 9' x 12' clear plastic tarp	_____	_____	_____
3 books of matches	_____	_____	_____
12 packages of cocktail nuts	_____	_____	_____
Cosmetic mirror	_____	_____	_____
One rifle with ammunition	_____	_____	_____
First-aid kit	_____	_____	_____
4 pairs of sunglasses	_____	_____	_____
One large, decorative candle	_____	_____	_____
		Total:	_____

Solution to Environmental Emergency Situation

CRITICAL FACTORS IN SOLVING THE PROBLEM

The basic problem that confronts the survivors is maintaining full control over their minds and the conservation of precious body heat—they must prevent exhaustion and hypothermia, the lowering of the body core temperature. This can be done by finding the best natural shelter available fairly close to the crash site. This will probably be on top of the snow using bark, snow, and trees to develop good windbreaks. As the situation progresses, it may be possible to use the skis, bark, metal pot, or plane parts to dig into the snow to form a cave or caves large enough to support all of the survivors. If the group provided shelter for themselves, did not become wet and chilled, did not drink ice water or eat snow, they should be able to survive for more than nine days.

The best policy would be for the survivors to make themselves as warm and comfortable as possible, and to remain where they are until the rescue teams reach them. Deep snow would make it virtually impossible to walk out and the tremendous loss of body heat due to getting wet and chilled would suggest staying where they are.

Keep in mind that the survivors are dressed in medium-weight clothing and have only a topcoat and questionable foot gear. It is going to be very important to use whatever insulation is available to keep their feet and clothing as dry as possible. They may be able to use boughs from trees, bark, limbs, or parts of the remaining plane to insulate them from the cold, wet snow.

In conserving heat the survivors should use all methods available. For example, they should huddle together, breathe through clothing, stay as dry as possible, take wet clothing off and dry it as soon as possible. They should keep insulation between themselves and the snow, keep out of the wind, drink warm fluids, try to get comfortable rests, and use their clothing and equipment to the best advantage.

The key steps toward survival would be to make themselves as warm as possible and as visible as possible. They should stay close to the crash site, erect whatever shelter they can, build a fire, heat up and drink warm fluids, and expect to be rescued soon after the storm abates.

EXPERT RANKING AND RATIONALE

#1—Four wool blankets

Of all the items, the four wool blankets are the most critical. Wool has good insulation qualities even when wet and can be used to wrap one or two people together, to form shelter walls, and to sleep in. A good bed of insulating boughs (green tree limbs) and the wool blankets can make colder temperatures fairly livable.

#2—One clear plastic tarp (9' x 12')

Like the blankets, the plastic tarp is critical. Plastic can be used as a windbreak, to cover area for fire, and to provide waterproofing. It can be wrapped or draped as protective outer covering. It could be used as a roof, as a wind protector, and as a shield. If a person gets really chilled, he could be wrapped (without wet clothing on) in a wool blanket and surrounded by plastic.

#3—Three books of matches

In addition to attending to the conservation of body heat, fire to warm the surroundings and ward off chill would be helpful for survival. The books of matches then become important in getting a fire started. There should be plenty of firewood available in this area. It would be important to keep the matches as dry as possible.

#4—One large, decorative candle

Although there should be a good supply of firewood available, getting a fire started may be difficult because the wood will probably be wet and covered with snow. Wet bark would have to be removed before attempting to start a fire. Candle wax serves as additional fire starter. The candle might also be used to light up the area at night and hence add to the morale of the survivors. It could also be used to heat up small amounts of water in the metal coffeepot.

#5—Jackknife

The jackknife would be useful initially in getting the fire started. It can be used to shave kindling, shave the candle wax, and cut small branches. It can be used to scrape snow and for small digging operations.

#6—One metal coffeepot

The primary use of the coffeepot would be to melt snow and heat water for drinking. Eating snow or drinking ice water lowers body temperature rapidly. The coffeepot could also be used as a digging tool if it were necessary to dig into the snow for better shelter or to form blocks of snow for a windbreak.

#7—Cosmetic mirror

The mirror would be useful during daylight hours to signal. Given the terrain, the location, and the fact that a flight plan had been filed, rescue undoubtedly would be from the air. Immediately after the storm subsides, someone should stand in the sun and be ready to signal rescue aircraft. Place the mirror under either eye and form a "V" (or peace sign) with the fingers of an outstretched hand. Reflect the sun through the "V" while having the aircraft visually sighted in the base of the "V."

#8—Flashlight (4-battery size)

Just as the mirror would be useful for signal purposes in daylight, the flashlight would be a signaling device when there is no direct sunlight, even though the likelihood of a night search is small. It would also be useful for providing light to the survivors if they had to leave the fire circle. Thus, it could be considered in terms of both safety and morale.

#9—First-aid kit

The first-aid kit may or may not be useful. The question would depend on the contents of the kit. Bandage and tape might be useful in constructing a shelter, as well as in caring for cuts and wounds. Medicine and drugs might be useful, but care must be exercised in their use.

#10—Four pairs of sunglasses

Sunglasses would be useful to prevent snow blindness and as relief for tired eyes. They might be useful for some of the survivors who have trouble sleeping in daylight or by the light of the campfire. Additional "sunglasses" can be improvised from clothing and equipment.

#11—One dozen packages of cocktail nuts

May be useful as a snack to relieve tension and to provide a small amount of body heat. However,.they probably are salty and would require more liquid intake. There is not enough of them to provide significant nutrition, but they probably would be somewhat of a morale boost.

#12—Sectional air map of the area

Would not be useful as a map of the terrain because of its scale, and might be misleading if it encouraged people to leave the crash site. Would be useful as fire starter and as insulation if stuffed under clothing.

#13—One pair of skis

Would not be useful for transportation and would probably encourage people to leave the crash site. Could be used as a digging tool or as a support for shelter.

#14—One rifle with ammunition

The rifle might be useful for signaling if ground rescue was possible. It would not be useful for hunting to supply food, because most animals would be hibernating or have moved down the mountain to lower altitude for the winter.

#15—Two fifths of liquor

The liquor would tend to be dangerous rather than helpful. Although drinking liquor gives the feeling of warmth—it actually causes the blood to move to the outer surface of the body where heat escapes and lowers the body temperature more rapidly. It can also contribute to carelessness by creating a false feeling of well-being. Save the liquor for celebrating recovery and thanking the rescue team!

Scoring

First seven are the most important. Most survival situations are rescued in the first 72 hours. Stay put!!! at least seven days. Maintain a Positive Mental Attitude. Remember—the pilot had to file a flight plan. You can easily make a game of this by scoring. Simply figure the differences between the correct answer and student's answer, total the figures, and compare to the following scale: Below 20—Great job! 20-25—Probably would survive! 25-30—Shaky!! Over 30—The great *Death Storm* has got you!!!

Appendix 2—Wind Chill Chart

THERMOMETER READING, DEGREES FAHRENHEIT*									
	50	40	30	20	10	0	-10	-20	-30
calm	50	40	30	20	10	0	-10	-20	-30
5	48	37	27	16	6	-5	-15	-26	-36
10	40	28	16	4	-9	-21	-33	-46	-58
15	36	22	9	-5	-18	-36	-45	-58	-72
20	32	18	4	-10	-25	-39	-53	-67	-82
25	30	16	0	-15	-24	-44	-59	-74	-88
30	28	13	-2	-18	-33	-48	-63	-79	-94
35	27	11	-4	-20	-35	-49	-67	-82	-98
40	26	10	-6	-21	-37	-53	-69	-85	-100
	Little danger for properly clothed person.				Increasing danger that exposed flesh may freeze.			Great danger that exposed flesh may freeze.	

The wind chill chart is of value in predicting frostbite only to exposed flesh. To determine the wind chill, find the temperature and the wind speed on the chart. Where they intersect is the equivalent temperature with the wind. For example, a 30° F temperature with the wind blowing 25 mph is equivalent to a 0° F temperature.

*To convert Fahrenheit to Celsius, use the following formula:
$C° = 5/9(F°-32)$

Appendix 3—Items for Automobile Emergency Kit

Emergency equipment to be stored in trunk

Spare tire, jack, tire changing tools
Tire chains that fit
Heavy rope or tow cable
Jumper cables
Signal aids—flashlight, flares
Shovel
Cat litter or sand for traction on ice
Tool box with multiple screwdriver set, crescent wrench, slip-joint and vice-grip pliers, roll of electrical tape, 6 feet of soft steel wire or baling wire, knife, small file, assorted nuts, bolts, springs, and nails.

Items for personal comfort

Sleeping bag or woolen blankets
Sunglasses
Old pair of prescription glasses, if necessary
Colored plastic tarp or poncho
Water
Metal cup
Freeze-dried food or emergency rations
Waterproof matches and fire-starter
Backpacker's stove and fuel
Extra, old woolen clothing
First-aid kit

For a pamphlet entitled "Surviving Winter Driving Emergencies," write National Safety Council, 444 North Michigan Ave., Chicago, IL 60611.

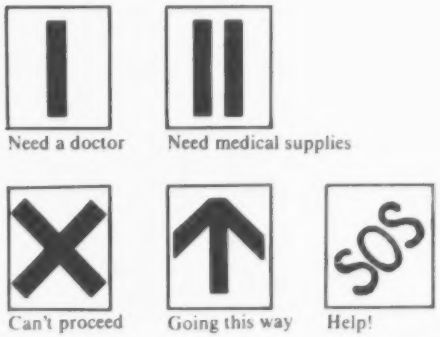
Appendix 4—Emergency Kit Sheet

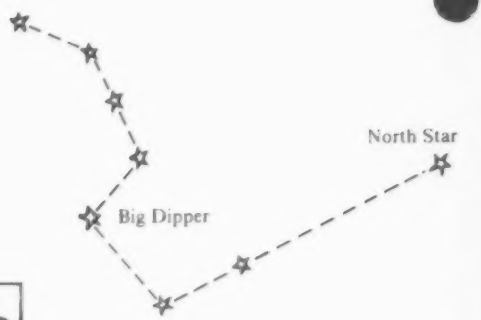
In an environmental emergency:
S—Slow down
T—Think
O—Observe
P—Plan

How to prepare for cold temperatures:
C—Clean clothes
O—Overheating avoidance
L—Layered clothing
D—Dry clothing

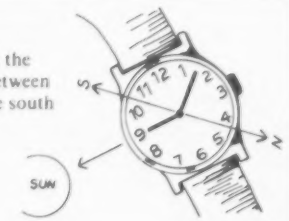
How To Attract Attention
1. Build a fire at night.
2. Send up smoke in daylight by throwing damp, green branches on the fire.
3. Build three fires.
4. Yell or whistle periodically.
5. Reflect light using a mirror or other shiny surface.
6. Fire 3 shots, repeating at 5-second intervals.

Ground-to-Air Rescue Signals





To find direction with your watch, point the hour hand at the sun. Bisect the angle between the hour hand and 12:00. That should be south if your watch is set on standard time.



INJURY	WATCH FOR THESE SIGNS	TREATMENT
Broken Bones	Pain, tenderness, deformity and possible bleeding.	Immobilize broken ends and adjacent ends. Control bleeding with direct pressure. Keep still and treat for shock.
Burns	Degrees 1st—Skin is red 2nd—Skin is blistered 3rd—Skin is charred	Burned area should immediately be immersed in cold water—70°F. Add ice to cold water but do not apply to burned surface. Apply a cold pack to difficult areas. 3rd degree—apply a thick, dry, sterile dressing to keep air out.
Heart Failure Epilepsy	Victim is obviously ill with no apparent external injury. Clutching chest, convulsions.	Send for help immediately. Loosen collar, assist to a sitting position, whichever makes breathing easier. Help with prescribed medicine. For convulsions, do not restrain victim.
Objects in eyes, ears and nose	Local irritation, tearing and wetting.	Eye: Don't rub. Lift particles out with corner of clean handkerchief. If unsuccessful or particle embedded, cover both eyes and get medical attention. Ear and nose: Get medical attention, don't try to remove.
Poisoning	Blurred vision, stomach cramps, vomiting, headaches, convulsions or deep sleep.	Get medical attention immediately. Check for antidote on poison container. If none available, have person drink lots of water or milk. Do not induce vomiting. Contact a poison control center immediately for further instructions.
Shock	Pale, clammy skin; irregular breathing; fast, weak pulse. Possible unconsciousness.	If breathing is regular and no chest injuries exist, raise hips and legs. If conscious and not nauseated, give liquids, but never alcohol. Never force fluids on an unconscious person. Keep victim comfortable.
Sunburn	Red painful skin and chills. Fever and shock occasionally accompany severe sunburns.	Apply cold compress to sunburned area. Get medical help for severe sunburns. Prevention: Use sunscreen lotion before and during timed exposures to sun. Stop exposure when burn is first noticed.
Unconsciousness	Victim is not awake, does not respond to external stimuli.	Keep victim lying down. Cover to keep warm. Turn head to side in case of vomiting. Get medical attention. Stand by to give artificial respiration if breathing stops. Liquids or foods should never be given to an unconscious person.

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Appendix 5—Suggested Evaluation

Written

1. List the priorities for life in the outdoors in the order of their importance.
2. Write a brief essay discussing the importance of a positive mental attitude during an emergency.
3. List what items you would include in a personal emergency kit.
4. Describe three types of shelters that could be constructed from natural materials in the snow and in the woods.
5. List the major signs of the following, how you would treat each, and how you would prevent each.
   a. hypothermia
   b. frostbite
   c. heatstroke
   d. heat exhaustion
   e. heat cramps
6. What do the letters STOP stand for? When do you STOP?
7. What do the letters COLD stand for? When should you abide by these?
8. Name five types of fear that you are apt to have to deal with in an environmental emergency.

Practical

1. Have students assemble a personal emergency kit. (Give them Appendix 4 to include in the kit.)
2. Assign students a particular type of fire to build and time how long it takes them to light their fire.
3. Take students on a hike. Using the sun, stars, or other natural phenomena, ask them to determine directions. (Check their answers using a compass.)
4. Have students create at least three signals that would communicate with a ground search party or an aircraft.

Appendix 6—Instructor's Key

Written evaluation

1. #1—Air
   #2—Shelter
   #3—Water
   #4—Food
2. See pages 13-14.
3. See pages 32-34.
4. See pages 17-19.
5. a. See pages 20-23.
   b. See pages 23-24.
   c. See page 26.
   d. See page 26.
   e. See page 26.
6. See page 14.
7. See page 73.
8. See page 15.

Specialists' Areas

Outdoor Skills Education Specialists and Conservation Education Consultants will assist you in obtaining materials and scheduling equipment and films that are available from the Department of Conservation. They also offer workshops to provide training in outdoor skills and conservation education.

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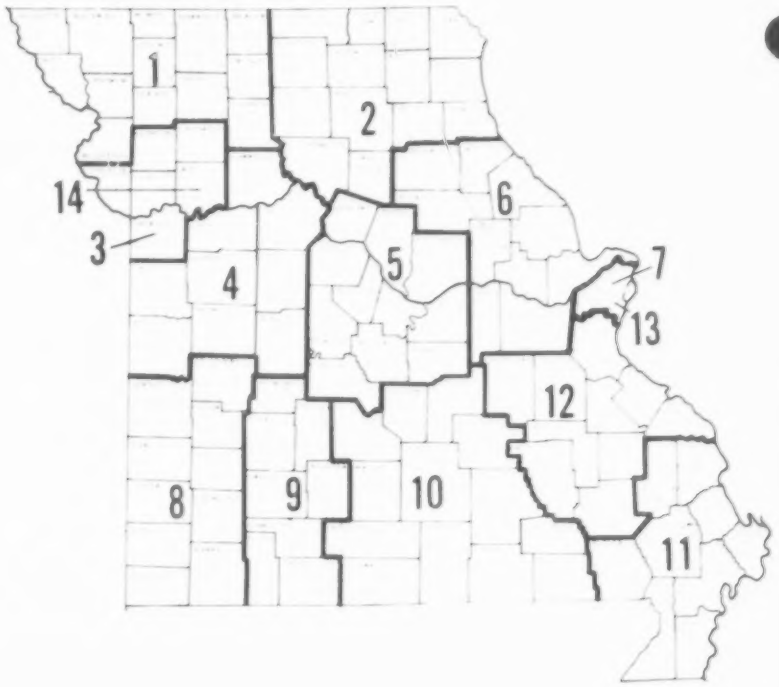

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